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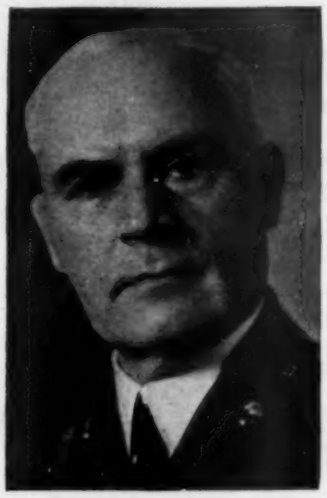
The Manufacturing Arsenals . . . and Their Equipment



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FROM the very earliest days of the Republic the proper supply of arms and other ordnance material received the careful attention of Congress and the executive authorities. Great difficulty had been encountered by the Continental Army in obtaining a dependable supply of satisfactory arms and munitions. In our early history as a nation there was a lack of the manufacturing facilities adaptable for the production of many articles of ordnance equipment. Even where such facilities existed, as in the manufacture of small arms, they were scattered over the country in small shops and it was difficult to obtain uniformity in equipment, so necessary in the military service. Furthermore, no Government organization was skilled in the design or production of such equipment, and still less in its improvement and development to adapt it to changing military requirements. Such considerations as these must have been behind the early efforts for the establishment of arsenals.

With the development of railroads the country gradually changed in character from purely agricultural to industrial, and some of the reasons for the establishment of government arsenals became less pressing. Facilities for the manufacture of all types of ordnance material became available. In general, however, our peace-time need of this material was never sufficient to encourage private manufacturers to specialize in its manufacture as they did in some European countries. Some exceptions were powder, small arms and other material for which there was a commercial as well as a military demand.

But important reasons for continuing the policy of maintaining Government arsenals remained. First, in order to keep pace with improvements in military equipment in other countries it was necessary that the Government keep a technical and engineering organization capable of accomplishing this object. While it is possible to produce new designs through the results of purely theoretical study, experience in the engineering field has shown that practical designs which will meet the requirements and which will also lend themselves to economical quantity production can only be arrived at through the construction of "pilot" models and their thorough test. The facilities of the arsenals enable this to be done readily and more or less continuously for all of our material.

Second, there is need for the Government to have in its own service personnel familiar with both the production and use of its specialized ordnance material. Such personnel is needed to train inspectors in case of sudden expansion. The manufacturing arsenals are training schools for this personnel.

Third, the production of ordnance material at arsenals gives the Government first hand information as to the cost of production. It may be stated that an excellent system of cost keeping is in use at all the arsenals.

George Washington in 1789 personally selected the site of what is now Springfield Armory for the establishment of a plant for the manufacture, overhaul and storage of muskets. An act of Congress of 1794 created the National Armory there. This location had been used for ordnance manufacture, storage and repair during the Revolutionary War.

By the same act of Congress which established a National Armory at Springfield another one was established at Harpers Ferry. This latter grew into an important member of the family of Government arsenals until the Civil War brought its active history to a close.

Some of the buildings at Springfield were constructed soon after the site was selected. Others were constructed in 1807-8, in the period 1825-30, and in the Mexican War period.

Soon after Springfield got started a military musket was standardized, replacing a heterogeneous collection of weapons which the army had previously used. Improvements were also made in production, as shown by the invention of the gun stock lathe by Thomas Blanchard at Springfield in 1822. From its origin until the Civil War the principal output of Springfield was the

smoothbore musket of that period. The manufacture of rifled muskets started in 1853. During the four years of the Civil War 800,000 were produced. In 1864 the output was over 275,000 and there were 3,000 employees on the payroll. In 1873 Springfield commenced production of the caliber .45 Springfield single shot breech loading rifle which was standard in our army for many years.

In 1892 the arsenal went into production of the Krag-Jorgensen magazine rifle which remained standard in our army for about ten years. In 1903 production of the present Springfield rifle began. A large number of these rifles were produced during the World War. At the height of war activities 5,103 employees were on the payrolls. Since the World War activity has been greatly curtailed, but Springfield has managed to keep the art alive. No important additions to equipment have been made since the war period.

Frankford Arsenal was established in 1815, although ordnance and other military activities had been in progress on its site for many years before. The initial arsenal buildings were completed by 1820 and the arsenal commenced the manufacture of small arms and cannon ammunition, their components and various articles of equipment. The arsenal has in general continued to the present day on the same line of work, though the designs of the articles manufactured have gone through many cycles of change. From the nature of its principal products it may be imagined that manufacturing activity has been promptly and greatly increased during each of our wars. The present small arms ammunition plant was built in 1860-65 and the artillery ammunition plant in 1916-17. About $40,000,000 of stores were manufactured during the World War, mainly small arms ammunition of various types, instruments, artillery ammunition and components. At the height of activity 6,110 persons were employed.

Precision Required

In its present activities Frankford Arsenal includes the manufacture of small arms ammunition, certain components of cannon ammunition and instruments. The latter include sights for cannon, quadrants, position finding instruments, plotting boards, range boards, etc. The optical parts of instruments, including lenses, are also manufactured. Most of the machines used at Frankford are small and many have automatic features. In general great precision is required in all of Frankford's products. Since its main product, small arms ammunition, is used in considerable amounts in peace time, Frankford is usually one of the most active arsenals. While at present most of its machinery dates back to the war or before, new installations are continually being made when they can be financed to advantage from current orders.

Watervliet Arsenal as established in 1813 was intended as the principal arsenal for the manufacture of "fixed" ammunition and all the small articles of equipment for a train of artillery, including harness and other leather products. Cannon at that period were procured from private foundries, but their mounts were manufactured at Government arsenals, mainly Watervliet and Watertown. Watervliet Arsenal took an active part in the manufacture of equipment used during the Mexican War, the number of employees rising at that time to 500. Similarly it was one of the most active of the arsenals during the Civil War, when 2,000 men and boys were employed.

As a result of the development of steel manufacture in the period following the Civil War, that material began to be used in the manufacture of cannon. Guns instead of being simple castings were made of successive hoops assembled by shrinkage. For their production accurate machining of large parts was necessary. No facilities for such work were then available in the United States. The Government therefore decided to erect a plant for the manufacture of these guns and selected Watervliet Arsenal as its site in 1887.

Another active period for Watervliet Arsenal was that of the Spanish War during which 190 cannon were produced. From its inception the gun factory at Watervliet was active in the manufacture of seacoast guns until the beginning of the World War.

The Condition of Arsenal Equipment

"The bulk of the machinery at all the arsenals is of the vintage of that produced before the war or earlier . . . "

SPRINGFIELD

"No important additions to equipment have been made since the war."

FRANKFORD

"At present most of its machinery dates back to the war or before."

WATERVLIET

"Practically no new equipment has been installed since the war."

WATERTOWN

"No material addition to equipment has been made since the war."

ROCK ISLAND

"The major part of the equipment dates back to the war or before."

PICATINNY

"The rebuilding through the special appropriation of 1927 (following the destruction caused by the explosion) accounts for the presence of somewhat newer machine tools there than at other arsenals."

Gun stock lathe now in use at Springfield Armory. An interesting example of early machine design

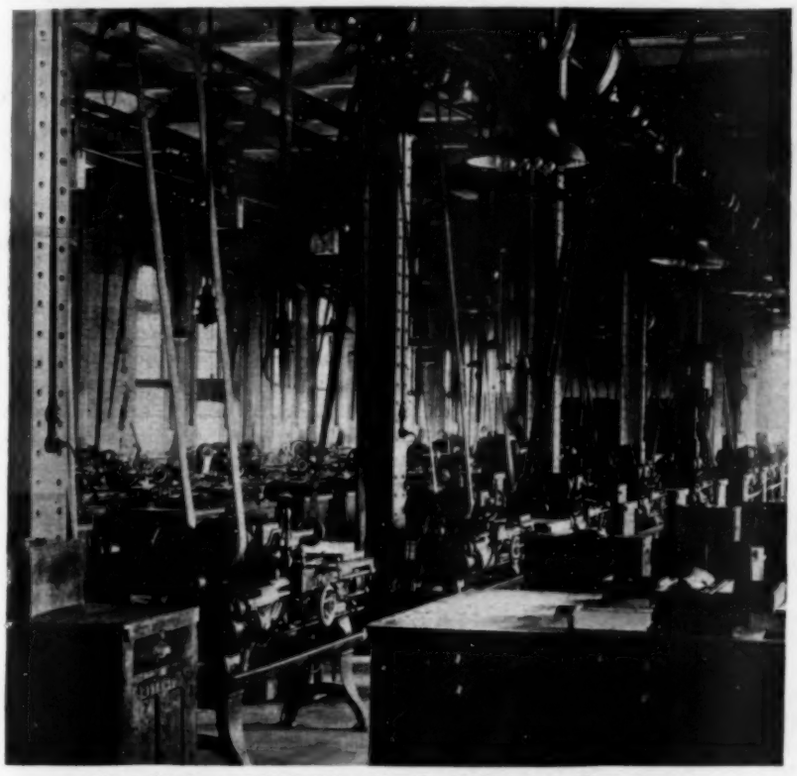
In the World War period a tremendous program of manufacture and expansion was undertaken. Whereas the total cost of the buildings up to that time had been $1,400,000 the construction during the World War added approximately $4,000,000 to the value of the buildings and $8,000,000 to that of the equipment. During the World War period Watervliet produced 875 guns of various calibers up to 16-in., relined or otherwise modified about 200 additional guns and produced many parts of breech mechanisms and accessories. Although a large amount of equipment was added during the World War many of the large lathes and other machine tools still in use date back to 1887-90 when the gun factory was established. Practically no new equipment has been installed since the war.

Watertown Arsenal was established in 1816 for the manufacture of field, siege and seacoast carriages and for the storage and issue of ordnance stores and materials. It was expanded in 1839 and again in 1867. It was modernized in 1891-92 by the erection of additional buildings and the installation of new machinery. Other additions were made previous to the World War, as in 1913 the manufacture and treatment of armor piercing projectiles was undertaken, and in 1914 an 800-ton forging press for gun forgings was installed. Just before the World War 937 persons were employed at this arsenal.

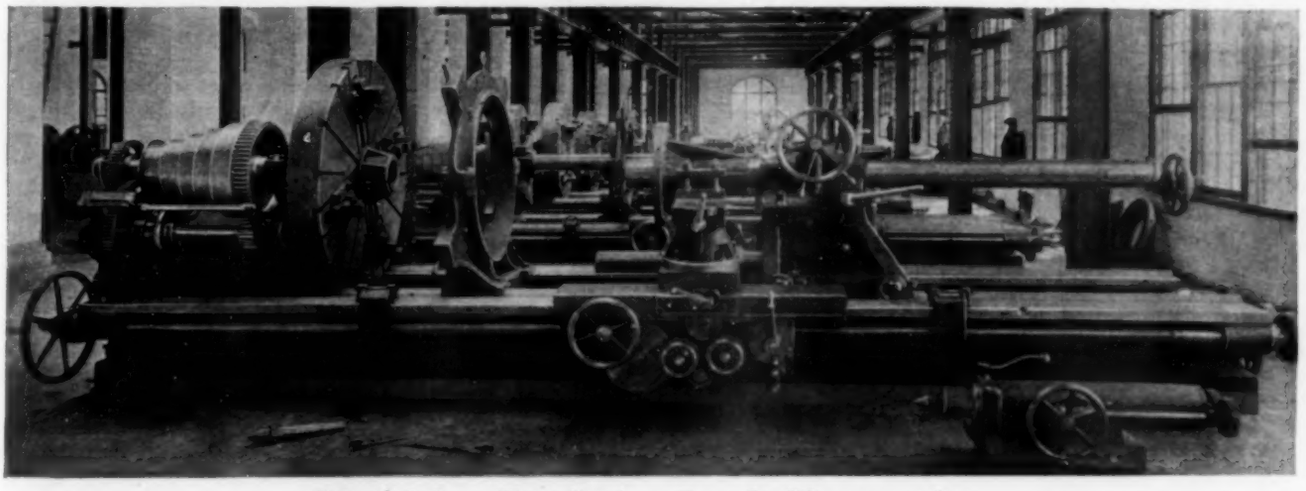
As at other arsenals the World War led to a large expansion in facilities and the undertaking of a large manufacturing program of ordnance material. The additional facilities included the construction of a seacoast erecting shop, a mobile carriage shop, a gun forging plant and a steel foundry, together with their equipment. A total of about $11,000,000 was expended in buildings and machinery. Watertown undertook the manufacture of 3-inch antiaircraft and 240 mm. howitzer carriages during the war. The maximum number of employees during that period was 5,044. No material addition to equipment has been made since the war. Watertown Arsenal is the seat of the metallurgical laboratory of the Ordnance Department. Established in 1873 this laboratory has made important contributions.

Rock Island Arsenal is located on an island of that name in the Mississippi River near the cities of Rock Island, Ill., Moline, Ill., and Davenport, Iowa. The title to the land was acquired by the United States in 1804 and the frontier post of Fort Armstrong was built at the northwestern point of the island in 1816. This was garrisoned until 1836, after which consideration was given to the establishment of a Government arsenal on the island, but it was not until 1862 that Congress authorized this action. By 1867 the series of stone shops constituting the Old Arsenal had been completed and the water power developed to a sufficient extent to operate them.

The work assigned to Rock Island Arsenal was the manufacture and repair of gun carriages and of infantry and cavalry equipment, such as belts, cartridge boxes, haversacks, saddles, bridles,



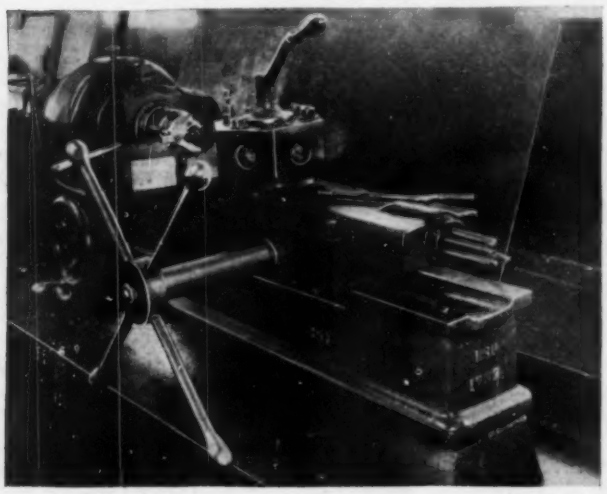
Line shafts and belt drives in the instrument department at Frankford Arsenal, as they have been for many years



Old gun lathe at Watervliet Arsenal, a splendid museum piece

harness, knives, forks, spoons, meat cans, tin cups, etc. Up until the Spanish War not over 500 men were employed. The expansion resulting from that war led to an increase of facilities and an increase of employees to about 3,000.

Immediately after the Spanish War the Ordnance Department decided to establish another plant for the manufacture of the caliber .30 rifle, in addition to Springfield Armory. Rock Island was selected for its location and the plant was put in operation with a maximum capacity of 125 rifles per day.



Left—Old hand screw machine in use at Picatinny Arsenal, a veteran that should have been pensioned

The water power available in the Mississippi River was an important element in the selection of its site and its development has kept step with the building up of the arsenal. With the installation of modern turbines there is normally a surplus of power available for peace-time operation.

With the beginning of the World War Rock Island was called upon to exert its maximum effort. Over $20,000,000 was expended for new facilities for manufacture and storage. During the period of the war $60,000,000 was disbursed at Rock Island on account of manufacture and purchase of material. The maximum number of employees during the war period was 14,000. There were produced during this period a great variety of articles. With the exception of rifles, all were of the nature of those for which the arsenal was originally established. They included among many others 1,500,000 bacon cans, 350,000 knives, 650,000 canteens and cups, 860,000 haversacks, 400,000 pack carriers, 100,000 sets of artillery harness and 115,000 rifles.

Since the war the arsenal has been active in tank and armored car development and manufacture.

The major part of the arsenal's equipment dates back to the war or before.

What is now Picatinny Arsenal had its origin with the establishment of a depot for the storage of powder and explosives near Dover, N. J., in pursuance of an act of Congress of 1879. The army powder factory was established at Picatinny in 1907. From that date, besides the manufacture of smokeless powder, the arsenal undertook in some degree the manufacture of propelling charges for cannon and the filling of projectiles with high explosive. During the war the operation of the powder factory was continued at an increased output and facilities for the storage of powder, high explosives and metal components of ammunition were greatly augmented.

Upon the ending of the war Picatinny became mainly a storage depot until a decision was reached in 1919 to organize a complete ammunition arsenal at this point. This decision led to the establishment of shops for the manufacture of metal components of ammunition and facilities for the manufacture and loading of fuzes and the assembly of complete rounds of ammunition. Almost the entire plant at Picatinny was destroyed in 1926 by an explosion in the adjacent high explosive storage depot at Lake Denmark. It was rebuilt through a special appropriation for the purpose in 1927-29. As now equipped the arsenal can manufacture and assemble all kinds of artillery ammunition, bombs and pyrotechnics. The rebuilding of Picatinny Arsenal through the special appropriation of 1927 accounts for the presence of somewhat newer machine tools there than at other arsenals. The technical division at Picatinny Arsenal operates chemical and other laboratories with facilities for complete chemical and engineering study of ammunition and all its components.

It will be seen from the above that most of the six manufacturing arsenals enumerated were greatly expanded during the World War. Large expenditures were made for new buildings, machinery and other equipment. In general a correspondingly large output of products was obtained before demobilization of the war-time force of employees. Since the war all of the arsenals except Frankford and Picatinny have been operating on greatly curtailed schedules, approximately five per cent of their capacity. While some purchases of machinery have been made annually since the war, such purchases have been limited to those which could be amortized with manufacturing orders on hand and none, with the exception of the reequipment of Picatinny Arsenal, have been in the nature of capital investments. The bulk of the machinery at all the arsenals is of the vintage of that produced during the war or earlier. This does not mean that machines of the latest type can not be found at each of the arsenals, but it does mean that such machines do not form any large part of their equipment.

These six arsenals, known as manufacturing arsenals, have a considerable capacity for the production of munitions in their several lines, but, with the exception of Frankford Arsenal, they have not been used for peace-time quantity production in any sense. The Ordnance Department has sixteen other establishments rated as proving grounds, arsenals or depots which are used for the purpose of proof, storage, issue, overhaul and repair of ordnance material. Some of these do work of modification, overhaul and repair which is similar to the work of the manufacturing arsenals, notably Aberdeen Proving Ground, Raritan Arsenal, Benicia Arsenal, and San Antonio Arsenal. These and some others require the limited use of machine tools.

Needed Expenditures

The War Department has approved a project providing for the procurement of machinery to the value of about $2,310,000 for the purpose of modernizing the equipment of the six manufacturing arsenals and other ordnance stations. Considering its distribution this machinery will form a modest addition to the capital equipment of these plants. If procured it will be immediately placed in use for the purpose of improving and cheapening the product of these establishments. It is not intended as a reserve, though it will add to the potential value of these plants in case of emergency. The procurement of this machinery would not only add materially to the value of the Government arsenals but would furnish employment during its production to the skilled mechanics of an industry which has been hard hit by the depression.

Inventory Control for Jobbing Shops

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Based on many years of experience and observation in jobbing and manufacturing plants this article tells how to keep inventories adequate, balanced and not excessive

IN VARIOUS manufacturing establishments having a so-called jobbing production, the inventories seem to be in no way related with the requirements. Although this matter is well controlled in many plants, it may be that the experience from my few ventures into this subject may be of help to others.

By job production, I mean that class of manufacture where various kinds of machines or units are produced in lots of varying size, and at intervals determined by sales requirements. Such a business may also have certain service manufacturing requirements.

The most common happening in such shops, at least where I have observed, is the production of such parts based on a maximum and minimum quantity, which in turn may have been pre-determined from such factors as quantity costs, previous usage or the whim of some manufacturing department head. Invariably in such cases when a decision is reached to produce a certain quantity of a given type of machine, it will be found that there are ample quantities of certain parts on hand, while the stock of others may be entirely depleted.

I recall one case where a company was manufacturing machines in lots of ten units, and these lots were manufactured about twice each year. On the lot which I noticed, for a large majority of the parts there was sufficient stock to build fifty machines, meaning that they had invested good cold cash in cast iron, steel and labor, from which no interest was being earned and which would have looked far better on their statement as "cash on hand." In addition there was a considerable inventory of raw material, and still the production department was placing orders for more parts, simply, as they said, to be on the safe side. Any machine may become an obsolete product with our present day trend toward improvement, and this outfit obviously was risking a large investment in something that might eventually sell for scrap. It is bad business. It is pretty hard to borrow money on questionable inventory. The trend of banking has been toward close scrutiny of such items on financial statements.

Ordering Your Requirements

It is altogether feasible and possible to build only what you need. To place your inventory under control is a comparatively easy matter to understand, although the length of time to accomplish the result is dependent on the quantity of parts involved in the production.

Assuming you have storage bin facilities for your finished parts, as well as raw materials, the next requisite is to have a running inventory record of these items. All raw materials should be received at and disbursed from a raw stores department, with some sort of written receipt and disbursement forms employed. Your finished stores department should have a similar method of handling receipts and disbursements, but on a different form or color of form. In no case should raw material from the outside, nor finished parts manufactured, be delivered directly to the machining or erection departments. The expense of having such items clear through your stores departments will amply pay for itself after you have suffered a sufficient number of inconveniences and duplications from not knowing where "this and that" have gone.

If you would have control of inventories you must not only clear through your stock rooms, but also give full authority to your storekeepers for receipts and disbursements. To expect to have your foremen interested in all such details is unfair. In every case, where opportunity permits, the average foreman will circumvent all system requirements in order to make the departmental showing which is desired. His intention is good but his lack of knowledge of the vital factors revolving around inventories makes him presume that some of this so-called system is not entirely necessary. All departments benefit eventually through control, and the manufacturing departments, particularly the erection floor, will be the strongest supporters when it is once established.

It is necessary to have a list of parts required to build one complete machine or unit. When the plant has been authorized to build a certain quantity of a machine, your production department should obtain an up-to-date list of the constituent parts. For each part listed, this department should make reference to the corresponding inventory record, and enter thereon the quantity required for this specific lot. After observing the quantity on hand, it is a simple matter to determine how many of these parts to order.

This method is known as "reservation," and in principle is nothing more than the idea you may use at home in budgeting your income. After the idea has been applied for a while, its value becomes more and more apparent in that where the same part is being commonly used for service, or on another style of machine, the reservation of the quantity required for each of these specific purposes not only permits the production department to order the exact quantity required, but in many cases permits increasing the size of an order recently written but not issued to the shop, thus lessening unit costs.

A Dangerous Assumption

I have seen numerous cases where the lack of a reservation has permitted a production clerk to presume the quantity he shows on hand to be ample for the requirement he has in mind, whereas he had previously made mental reservation for the same part against another

lot of machines which utilize the same part, only to find when erection actually started that they were completely short the material for one of these lots. Very often service delivery promises, based on materials on hand, and where no reservation system was employed, have caused service departments to do some tall sweating when they finally wished to make delivery of the parts, only to find they had been used for production purposes.

I have found a good rule to follow for service requirements is never to carry in excess of a six months service requirement. This means the quantity to be carried may vary as the previous six months usage varies. The re-ordering may be done when the supply appears low. The amount ordered, plus the quantity on hand, should not exceed six months requirements. Obviously, you can not wait until you run out of stock. Where the call for a part is an average of less than one in six months, then none should be carried on hand. Of course, there are exceptions to any rule, and there will probably be certain parts, one of which should be carried for emergencies where you are fairly sure of an occasional call.

When ordering parts for a production lot, it is always well to add to the quantity ordered the amount necessary to bring your service stock up to a six months requirement.

When this lot is checked out of stock and the parts are deducted from your inventory record, this entry should be made opposite and on the same line with the reservation record. This permits the production clerks, as well as any others, including your auditors, to obtain quickly the reasons why you have certain stock on hand, and whether or not it is of value as a live item. Where the quantity of parts on hand is not sufficient at the time the lot is checked from stock, then, although the quantity actually issued will be entered on the same line as the reservation, a new reservation should be made on another line for the net remaining quantity needed. When these finally are manufactured and issued to the lot, the entry will be made on the same line as the last reservation. This method permits observing quickly all remaining requirements for this part.

Effect on Purchasing

The idea of reservations to determine requirements also has a bearing on your purchasing. There are many items which when bought in quantity may be had at a unit price that is decidedly attractive as compared to that for lesser quantities. Where the purchasing department is advised of your definite requirements, surely there is no need for buying larger quantities unless the item is so commonly used throughout all of your types of production that there is a surety that the material purchased will be consumed within a reasonable period —say six months. If there is no assurance that the entire quantity can be applied against apparent requirements, then excessive quantities purchased simply means you will eventually have to scrap material, which will probably bring the net cost of those used up to what the original cost of a lesser quantity would have been. There is nothing more necessary in any organization than a good buyer, but enthusiasm on quantity purchases must be guarded against and based on facts.

Obsolete Inventory

Accumulations of inactive inventory from the past, together with discontinuance of production of certain models, as well as unlooked-for reductions in service requirements will at times leave the best controlled outfits with some obsolete parts. Their only value lies in the possibility of a service call or scrap value.

Some means must be definitely established to write off such items at intervals during the year, thus permitting a gradual monthly housecleaning of the inventory account, instead of the shock received when it is done at the end of the fiscal year.

As any machine is discontinued from your list of sales offerings and the last one has been sold, your manufacturing department could be notified of this discontinuance. At the same time a policy should be established somewhat as follows:

1. Constituent parts of a discontinued or obsolete machine that have been called for in service during the last one, two or three years (as you desire), will be retained as "Active" finished stores items.

2. Such parts as have not been called for during that period are to be considered "Inactive" stores and all records to be marked accordingly. The parts to be physically removed from "Active" stores, placed in "Inactive" stores, and the accounting or cost department furnished with a record of these parts, which, after being priced, will be written off of the finished stores inventory account.

3. Constituent raw materials for such items to be scrapped, the records marked "Inactive," and their value reported and written off of that inventory account.

4. Inactive items remaining in "Inactive" stores for five, six, seven or as many years as you desire from the date of last usage, and in any case, not earlier than that period of time after the last machine was sold, to be definitely declared "Dead."

5. Such "Dead" items to be removed from "Inactive" stores and scrapped and the inventory records of these inactive parts reduced to zero and the records marked "Dead."

It should be noted that this method permits retaining for possible service inactive parts whose value has been written off. Obviously, the profit on such sales is the sales price. It is well to make certain exceptions to the above rules to permit your manufacturing department to retain certain types of items in "Inactive" stores for as long a period as they deem necessary. That is, items of a type which are extremely hard or expensive to produce, and which cost you nothing to hold, and are, on the other hand, inexpensive if produced singly.

An annual review of inventory records, in addition to the periodic obsolescence of machines, will permit your production department to look over all inventory records gradually during the fiscal year, and transfer from "Active" to "Inactive" stores those items which are parts of obsolete machines but for which service requirements have disappeared, thus removing them from the classification of "Active" to "Inactive."

Some action should also be taken concerning patterns, jigs and fixtures at the time "Inactive" items become "Dead." Some exceptions will have to be made but in a general way these items can be removed from your asset accounts, if so treated, thus keeping these particular accounts, as well as your inventory accounts, backed up by live usable material.

I have made no attempt in the foregoing to go into certain details in connection with control of inventory. The purpose has been to touch on the high spots of a method which will permit you to produce only what you want, with a record which will assist your executives in knowing quickly if production is functioning on inventory matters as intended.

Floating Power for Machines

We have heard a lot about cushioned mountings on the various makes of automobiles. Their use on machine tools seems to be a logical development. Integral mounted motors must find a support somewhere on the frame of the machine; with a solid mounting this arrangement transfers motor vibration to the machine. The manufacturer of a well-known grinding machine has overcome this difficulty by mounting the motor on rubber, driving through V-belts.

Machine Tools for the Soviets

A. M. WASBAUER

The author's three years in Soviet Russia, the last one with the Design Commission in charge of heavy machine tool design, put him in a position to make entirely practical suggestions to machinery builders who expect to sell to the Russians

WHEN the credit situation becomes clarified between the U.S.A. and the U.S.S.R. following the recent resumption of normal diplomatic relations, our machine tool industry should participate as the guest of honor in a real heart-warming trade revival with Russia. Machine tools should carry away the pennant of export business with the Soviets, because they are the primary equipment of all mechanized industrial enterprises, and must take precedence over consumer's goods equipment in any large scale program of progressive industrial expansion such as Russia has embarked on with limited sources of capital outlay. It was stated in Pravda back in 1930 at the time that Russia was placing her largest machine tool orders here: ". . . we must strive to attain to a position where our imports will contribute to the transformation of our country . . . into a country producing machines. Our imports must serve to help us to assimilate up to date technical knowledge."

It is no faint compliment that all Russian engineers and shop executives should recognize the superiority of our machine tools over the European product in capacity to produce, and with some rare exceptions in the optical gaging field, in accuracy of finished work, considering that nowhere has there been a better opportunity to make comparisons. All Soviet industries in the infant and parent classes have had several years in which to observe that fact, machines of equal characteristics but different countries of origin having been often placed side by side, particularly in the last two years, when the bulk of imported machine tools came from Germany. The lapse of time only serves to drive that fact deeper home, when not even the occasional advantage of neater appearance remains to the foreign or European product.

Several trends are apparent which indicate in a very general way the direction of development of Soviet industrial expansion and the probable predominant classes of future machine tool purchases. Originally, hunger and insecurity directed industrial development toward national defense and the mechanization of agriculture as broad primary aims, and directed imports of equipment to their satisfaction. Transportation had to develop as a corollary of industrial expansion but was not able to keep the pace, and has now become a serious hindrance to continued expansion, in spite of the new giant Lugansk Locomotive Plant and the partial modernization of other large railroad plants like Columna. This should indicate large purchases of locomotives and railroad shop equipment.

The next imperious needs of life to be satisfied are clothing and shelter. The provision of shelter is nowhere so mechanized as that of clothing, and will be so reflected in the volume of foreign purchases. On the other hand, there will probably be a considerable demand for the most modern type of excavating and road building equipment, because of the very large labor saving capacity of this type of equipment in contrast to the extremely low productivity of Russian labor, a condition which has become a serious drag on the projected rate of industrial expansion. The present clamorous demand for clothing and the projected expansion of this and allied industries during the second Piatiletka, ranging from 100 per cent increase in cotton textiles, to 500 per cent increase in wool textiles, to 1,000 per cent increase in silk textiles, to 2,000 per cent increase in knitted goods and 250 per cent increase in leather shoes, will call for an enormous increase in manufacturing equipment, but this being consumer's goods equipment it is not to be expected that much of it will be purchased abroad. On the other hand, manufacturers of machine tools entering into the production of textile and shoe machinery may look forward to a good harvest.

But the foregoing is only a prelude to the machine tools that will be required to bring to adolescence the present infantile Russian machine tool industry proper, and this, at present, is the key log holding up the jam of Russian industrial expansion. The foremost need of Russia five years ago was to mechanize agriculture in the shortest possible time. To accomplish this, a number of mammoth industrial plants were bought almost complete in America and elsewhere. It is my opinion that given sufficient satisfactory credits, Russia will now wish to buy complete machine tool plants in America, along with technical assistance. The few machine tool plants which have so far been organized with a mixture of foreign machine tools and under mixed foreign leadership have not been shining successes, as may easily be imagined. The success of the present Russian industrialization plans depends on the provision of efficient machine tool plants organized on a production basis for the manufacture of standard machine tools on a large scale, and on technical assistance from special machine tool builders.

Simplicity and Adaptability

According to the requirements laid down by the Moscow Central Machine Designing Bureau (Stanko-O'bedienieny) for the guidance of engineers, machine tools are desired which are quickly and easily adaptable to the use of either high speed or carbide tools without too many steps of mechanical feed and speed changes, the total variation from high to low feed or speed being preferably split into two ranges available through pick-off gears or some other suitable means. Sturdiness and safety of operation are the main requirements. Sturdiness is understood to mean not only resistance to wear and to vibration of the main elements of the machine under maximum duty, but also the avoidance of delicate control mechanisms. Particularly must the hand control elements of the machine be able to withstand the roughest usage.

Safety of operation is equally important, both as regards the safety of the

operator and of the machine. The safety devices should be as sturdy as the rest of the machine, which is not always the case even on American machines. European machines are of course greater sinners in that respect, occasionally providing ginger-bread safeties, or no safeties at all. I have seen a recently built European boring mill in which some gears were repeatedly stripped because shift levers did not properly interlock. Colored lights and sound warnings are desired in addition to the positive safeties, to warn not only the operator but others also when a machine is being improperly operated. This is bound up with the psychology of Russian shops where each man's is every man's business, and a careless operator is likely to be as severely taken to task by his neighbor as by his foreman for any misbehavior. Any new scheme or gadget of a substantial nature adding to safety of operation will be welcome on machines for Russia.

Foolproof Lubrication

Lubrication is almost as important as the safety devices, and should be as automatic and foolproof as it is feasible and practical to make it. I have in mind a large American machine having flat table ways lubricated from a reservoir in which the supply was invisible without climbing on a stool, and in which the oil holes were exposed and the supply allowed to escape when the table was run out its full length, unless a valve was first closed. I cite this as a horrible example, not as a common occurrence. No expense should be spared to make lubrication an integral part and automatic function of any machine for Russia. One more suggestion pertaining to lubrication: Any machine having a lubricant circulation system should have a circuit breaker connected to the drive motor, and operated by a plunger in the main delivery line of the pump to shut off the drive if the oil circulation fails. This can be a simple inexpensive device and the circuit breaker an ordinary limit switch. On large machines where the lubricant pump is motor driven, the wiring should be so arranged that the pump motor must be started before the machine will move. These things can be so easily contrived that there can be small excuse for leaving them off, once their importance to the life of Russian machines is understood. German machine tools are coming more and more to adopt flood lubrication to all vital moving parts, sometimes providing thick plate glass windows at various points for observation of the oil flood. For Russian conditions, a combination of flood and splash systems is probably the safest, with a circuit breaker in the oil delivery line such as mentioned above.

***Plenty of supervision*—"In Russian shops each man's business is every man's business, and a careless operator is likely to be as severely taken to task by his neighbor as by his foreman."**

No single factor will advance the sale of American machine tools to Russia more than printing thorough instructions in the Russian language for the benefit of foremen and operators. The more data is provided in Russian on every feature of the machine, the more views, cross-sections and set-up sketches, the easier the sale will be. These will be reproduced in many Russian magazines and will gain the maker a popularity for his product proportionate to the thoroughness of his literature. Most of our English and German competitors supply their Russian trade with operating instructions, performance data and house literature in Russian. This material is usually clear and dependable. When the same material has to be translated in Russia, it is often done by translators who lack knowledge of the language and lack technical training. The result is usually tragi-comic.

Electric current consumption and economy are far more important considerations in Russia than in America, and should be nicely adjusted to the needs of the machine. The practice of some American manufacturers to provide oversize motors as a safety feature may be commendable here, but is not popular with Russian engineers. Further, the subject of machine performance will be clarified by exposing the factor of cubic inches or cubic centimeters of metal removed per kilowatt-hour, or in other ways tying up the work accomplished with the power consumption, and in the case of cutting machines with feeds, speeds and tool pressures at the cutting edges. Russians are sticklers for such details. They love comprehensive performance tables, graphs and charts, as well as elaborate illustrations of constructional details. In case of motor-break down, the only flange replacement motors available from Russian stock are of the A.C. squirrel cage type, and this is the desirable motor for gear drives as establishing permanently correct gear centers. Motor gear drive failure is not uncommon in Russia, and is usually due to dislocation of the motor, or lack of provision for automatic or permanent lubrication.

The Russians are bound to appreciate any effort on the part of American manufacturers to conform to their voluminous standards on parts and practices. The Germans have a great advantage over us in this respect since many of the Russian standards are copied from the German DIN standards, while others are their first cousins. Emulating the thoroughness of the Germans, the Russians have attempted reduction to formula and standardization of practically everything under the sun, so that the conscientious designer

spends fully half of his time poring into thick volumes of standards. Of course, it is obvious that with the handicap of a different measurement system, American machines cannot conform to Russian standards in any appreciable way, but it is possible that machines built strictly for Russian export may incorporate some of the simpler Russian standards such for instance as preferred dimensions, which are linked with the gaging standards; or the Russian standard geometric ratios of 1.26 and 1.6; or in tool holders the Russian standard tool shank sizes.

American manufacturers will confer a boon on their Russian customers by emphasizing to them the importance of buying replacement parts with their machines, and extra sets of special small tools, particularly wrenches, which magically disappear and can never again be found. Greater concern for the future servicing of the machines sold abroad will pay. No machine should ever leave this country for Russia without a duplicate set of anti-friction bearings where these bearings do not conform to the Russian standard bearings available there, nor without a triplicate set of wrenches, and a triplicate set of instructions in the Russian language. This applies to fixtures as well as to machines. The instructions should not overlook a single operating detail. American readers will perhaps understand my remarks better if I state that I have observed fixtures provided with equalizing jaws and adjustable rest pins which had been in use six months without these features ever being used, simply because up to that time no one had understood what they were, and no detailed description of the fixtures and their operation had been supplied. Naturally the work suffered, as did in the Russian estimation the reputation of the manufacturer of this equipment.

Rest Cure for Worn Gages Discussion

M. P. DALTON

John Godfrey's note (*AM*—Vol. 77, page 666) is of interest to engineers. It is a subject about which we seem to know very little. How often is wear the cause of changed dimensions? I have seen motor cylinders condemned for being worn oversize while the original machining marks were visible. I have seen fine limit plug gages go below size in one day's use. What wore them and why? One had been used about twelve times hourly in a clean, reamed hole in mild steel by a careful inspector. The diameter was about 4 in. The plug was made of hardened carbon steel, lapped. The gage entered the work one inch, making a total travel of five feet before the gage was discarded as undersize. The cause could not have been speed, pressure or abrasive material.

Ring gages grow inwards after a rest, the bore closing. If the metal expands freely and homogeneously, the outer perimeter expands faster than the inside of the bore. Pressure is therefore produced somewhere in the body of the ring. As the metal also grows radially, there is a conflict between the radial and circumferential expansion. With certain ratios of rim thickness and bore and outside diameter, the hole may either open or close.

This is a problem for the mathematician and is of some importance because the same thing happens when a collar is shrunk onto a shaft. I have heard of cases where the ring closed on heating within a certain range of temperature. Of more interest is the opinion of some engineers that the shrinkage allowance of a large locomotive tire—1/1000th of diameter—strains the body of the wheel and the tire beyond the elastic limit. There seems to be nothing published about this question of local deformation beyond the elastic limit, as in the Brinnel test. Does any reader know anything about where the elastic limit lies?

Suggestions From the Men Discussion

W. R. NEEDHAM

John E. Tyler (*AM*—Vol. 77, page 715), deals with a matter of considerable importance, both to the men and the company. The foreman should not be liaison officer between men and management in this matter of suggestions from the operatives. It is better for the foreman, and for the men, that something in the nature of the ballot box be provided. Generally the foreman's time is fully occupied in the normal advisory, supervisory, disciplinary and clerical work of his department. He seldom has the time to enter into discussions concerning various suggestions his men may present. He can seldom give his attention to the calm, judicial, dispassionate, detached, pattern advocated by Mr. Tyler.

Granted that it is up to him to deliver the goods, he must possess and exhibit the virtues of tact and impartiality that are in that case rightly insisted upon in the original article. But it is asking too much, I am convinced, from the ordinary harassed foreman. Nor is it ideal for the men themselves that the decision of the merit of their ideas should be put up to the man in charge of their particular part of the shop. He would be open to the charge of favoritism or jealousy. If the foreman be a just man and genuinely interested in the welfare of the men under him, he will give good advice for what it is worth, should he be asked for it.

The foreman should act, not as an executor, but purely as a voluntary adviser.

Operating Under the Electrical Manufacturers Code—Discussion

A. W. FORBES
Forbes & Meyers

In your discussion of the effect of this code (*AM*—Vol. 77, page 777), you failed to mention the only important ways in which this code affected our business. The hours were not an important factor and will not be until business is sufficient to reach the 36-hr. limit, which has not occurred yet. Rates of wages for experienced men had no material effect.

The most conspicuous change brought about by this code is the closing of apprenticeship. The code makes no provision for apprentices except to hire them on the same basis as regular adult workers, a thing which it is impracticable to do. The immediate effect of this banishment of apprenticeship is not so great as long as there remain enough previously trained men, but the long time effect must be greater. As the code takes away opportunities for advancement from the boys, it must result in a larger number of men for unskilled positions. It will certainly be possible to select the unskilled men with greater care, and consequently increase the efficiency of the unskilled work. The code will be instrumental in forcing the less desirable of the unskilled men onto the dole. At the same time a growing shortage of skilled men must retard production and still further reduce the opportunities for the unskilled.

A second effect of the code has just recently come to our attention. Under the provision for open prices, we have just received notice from the Supervisory Agency that before sale of a long list of types of motors with their variations, prices must be filed with the agency, and 150 copies sent them for distribution. For a business that does not sell a standard article but designs for each application, there remains a doubt as to how this requirement is to be carried out. Is it necessary to send 150 copies of each quotation? Or will it be sufficient to send 150 copies after the quotation is accepted before the sale can be legally closed? Both seem unreasonable, and some other method may be used. At present the price situation is in an uncertain condition.

Demagnetizing Machine Tools

RALPH M. CHURCHILL

SERIOUS trouble from residual magnetism in machine tools and equipment has been brought to my attention on several occasions. The most serious loss in manufacturing from this source is the drop in production from clogging of chips around the tools. The first serious complaint was in the winter of 1915-16. A customer stated that the lathes he had been shipping out had in some manner become magnetized and were causing complaints from users. Production was very low and customers threatened to return them. One report stated that the production had dropped to 40 per cent of normal.

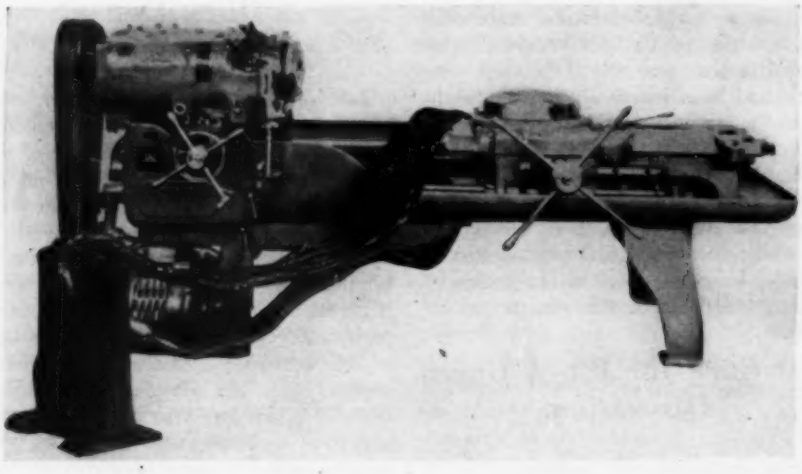
I took the question up with several transformer engineers without success. One of the best known professors of electricity and magnetism agreed with me that the only solution of the difficulty was to subject the affected machines to the flow of an alternating current in a coil of wire. But he could give me no practical suggestions as to the amount of current required or the method of application.

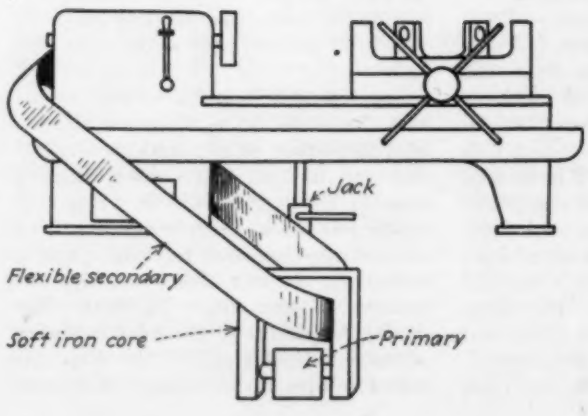
I visited the customer's plant and experimented with a lathe which I found to be badly magnetized. I marked the magnetic polarity of the several parts of the machine. On placing a pocket compass to the headstock of the lathe the north point of the magnetic needle would always be attracted to it, showing conclusively a condition of residual magnetism, because a piece of iron without magnetism would have attracted either point equally. The points of the machine to which the north point of the magnetic needle were attracted were marked with a plus sign and the points to which the south point of the needle were attracted were marked with a minus sign.

To determine the number of ampere turns required to eliminate the residual magnetism I made a rectangular frame of wood which could be passed over the lathe. This frame was wound with several hundred turns of insulated wire. The ends of the coil of wire were connected with a 220-volt a.c. electric circuit with a water rehostat in series to regulate the amount of current. With the coil lying on the floor and circumscribing the support on the headstock end of the lathe, the current was turned on and the coil passed up the support, over the headstock, along the bed, over the turret and down the end support of the lathe to the floor. At this point the current was gradually reduced by the use of the water rheostat. A number of trials indicated that about ten thousand ampere turns would be required to eliminate the residual magnetism in this particular lathe.

Having now some fairly definite figures as to ampere turns to work with, the problem was to get a piece of apparatus flexible enough to do the work in a customer's plant and not disrupt production. I finally decided to use an air-cooled transformer with a short-circuited secondary such as used in electric welding. The method is illustrated herewith. It consists of a rectangular core with supports and a primary winding, or coil, with a rating of about 25 kw. and a secondary which was made up of six strands of extra-flexible dynamo cable about 1 in. in diameter and 20 ft. long sweated to heavy copper terminals. This equipment would give 25-30,000 ampere turns by passing the secondary cable around the core of the transformer one turn and bolting the copper terminals together. In case more turns were required the secondary could be passed twice around the core thus doubling the ampere turns.

With this equipment it was only necessary to jack up the lathe so that the support under the headstock was 1¼ in. from the floor and pass one side of the flexible secondary coil under the support. The coil was then passed up the support and over the headstock. At this point a helper removed the jack. The coil was passed along the bed and over the turret. While the coil was being passed over the turret the helper quickly jacked up the turret end of the lathe. Then the coil was passed down the turret end support, under the support and away from the lathe. In passing the coil over the different parts it was kept as close to the metal as possible at all points. The residual magnetism was eliminated with one pass and





After the headstock end was jacked up, the flexible secondary was placed around the legs, the current turned on, and the secondary moved along the machine to the tailstock legs, which were jacked up for removal of the secondary. Time, 10 min.

with this equipment the time required was less than ten minutes.

The success of this equipment brought inquiries from a number of sources; such as demagnetizing large dies, gun forgings, gear shapers and heavy-duty engine lathes. The equipment is so flexible that it can be used to demagnetize any type of tool or equipment desired.

The remedy for the trouble having been found, the next step was to find the cause. Soft cast-iron castings are not subject to residual magnetism, but these lathes had a chip pan of thin iron cast integral with the bed of the lathe. This pan being thin may have cooled so quickly that there was a hard layer on the outside of it which retained the magnetism. On examination of the foundry where the castings were made I found that they were using a large magnetic chuck on the traveling crane to lift the work. I also found that they held the castings of the beds up on this chuck while they pounded out the cores. This last operation was an ideal way to give the castings a good charge, as the best method of making permanent magnets is to subject them to magnetism and to vibrate them during the process. After the explanation of the trouble and the suspected cause the use of the magnetic chuck was discontinued, and chains and hooks were used in its place.

A Crane Built in 1850

Artistry and engineering are sometimes combined in unusual and interesting ways. This crane, built in 1850, in the yards of the Alsace and Lorraine railway at Bas-Rhin, France, is an excellent example. The heavy cast-iron column is topped by the large head and forelegs of a well modeled lion, being held in place by substantial flange bolts. The large, upper gearing is held beneath the paws, while the tie or guy rods are held in his jaws.

The crane has a capacity of 10-tons and is operated by the counter-balanced hand crank shown just above the stone platform or base. The lower portion of the gear train is enclosed with sheet metal guards, this probably being an addition after safety became more a part of design than it was in 1850.

From an engineering point of view, the use of the round, built-up crane arm, is of great interest, as this has come to be considered desirable in modern design.

How Smooth Bearings Discussion

C. G. WILLIAMS
Consulting Engineer

In his mention of railroad driving axle journals (*AM*—Vol. 77, page 607) and the original condition of the surface left after machining, John R. Godfrey hits a spot in memory.

It is well known that a dead smooth bearing surface is the one that will last longest under any type or condition of lubrication. On the majority of railroads, the bearings referred to are rolled with a hardened steel roller to pack the metallic particles of the surface, and by cold working make the surface layers of steel harder and more dense. Generally speaking, this has been successful, but even this procedure has not always been sufficient to eliminate the hot box when breaking in a new or repaired locomotive.

Because of the method of lubrication, some master mechanics have left the journal slightly rough under the mistaken idea that these irregularities in the journal will fill up with the grease and thus aid in breaking in the journal by furnishing more lubricant when needed.

This was tried out on one railroad, three locomotives of the same size and type then in the shop being used for a series of tests. One had fine turned journals, one had rolled journals and one had ground journals. Three of the best engineers on the division broke them in and ran them for three months. The locomotives were then put on the drop pit and the journals examined in the presence of the three engineers, the master mechanic, the shop superintendent, the assistant shop superintendent and the mechanical engineer. Each of these men wrote a report as to the condition of the journals. The work reports and notes that the engineers made after each trip and after the breaking-in trip giving a summary of the lubrication effects and approximate heat condition of the journals on the three locomotives were now compared with the inspection report of the three locomotives.

The work reports showed that the fine turned journals had a tendency to heat for the first three weeks. The rolled journals had given no trouble after the first week, while the ground journals had given no trouble and had shown no tendency to heat up.

The fine turned journals, in every case, had blackened or browned spots caused by over-heating. The journals on the other locomotives were apparently in equally good condition. The fact that the daily trip reports on the locomotives having the ground journals indicated a normal condition, even while breaking in, influenced the shop superintendent to recondition a grinder and to give orders that all journals thereafter were to be ground. And now comes the oil lubricated journals on locomotives and all journals ground. The practice will probably be a rough grinding operation to remove metal and true up the journal and a finish operation with a very fine wheel giving a mirror finish. It is believed that the next few months will decide, on that road at least, not only what type of lubricant, but also "how smooth bearings."

Mike and the "Plumps"

JAMES H. FOLLEN

While working in a Milwaukee shop as a toolmaker, I was under the charge of a little dried up German foreman named Emil. Things were far from perfect in this shop and every job had its quota of grief. Drawings were few and most of the work was from verbal instructions—"Bore out these castings to 3½ in. but leave them a little scant as the reamer is under size."

We had a big Irishman named Mike Reardon, one of those big handsome black Irishmen, always in good humor and smiling. Mike had made a job "scant" the week before, according to orders. It proved to be too scant, and he was bawled out as a result. So when the foreman rushed in and called Mike to "Take these pistons and finish them up as quick as possible as they are rushed; turn them to 7½ in. with a smooth finish." As an afterthought the foreman said "make them a little plump, Mike, the reamer cuts oversize."

Mike said nothing, but came back a little later with his calipers and said "You better set my calipers on that job, Emil." The foreman, with a contemptuous look, said "Set your calipers, eh, why I thought you hired out as a first class man. Can't you set your own calipers?"

"Oh, I am about as good as the rest," said Mike, "but there ain't any 'plumps' on my scale."

A Tougher Peening Tool

Broken peening tools are a frequent cause of lost time and minor irritation in the machine shop, so a question sent in to *Nickel Steel Topics* and its answer may be worthy of note: *Question*—"We are sending you under separate cover part of a broken peening tool, on which we would like to have you examine the fracture and suggest a superior material, as we have had numerous similar failures. It is made of a high carbon tool steel."

Answer—"An examination of the broken head of your peening tool would indicate that it broke as a result of a fatigue fracture starting in at the bottom of the notch.

"While the material you have been using is a high grade of tool steel, we would not consider it suited for this type of work. We would suggest a steel which will give you sufficient hardness to prevent wear, combined with the maximum amount of toughness. This combination can be found in a nickel-chromium steel corresponding to SAE 3145.

"We would suggest that the steel be purchased in the annealed condition, after which it should be heated to 1,500-1,550 F., quenched in oil, followed by a drawing operation at 400—425 deg. to be held at this temperature for about one hour. This treatment should result in about the same hardness as the steel you have been using, but you will find it very much tougher."

Green Hands

ROBERT S. ALEXANDER

Noticing a new poster on the shop bulletin board the other day, I stopped for a closer look. It showed a pair of human hands, colored green, and underneath the picture was printed a reminder to employees, particularly new employees, to protect their hands from injury by exercising caution and using safety guards where necessary.

That poster set me thinking of the many old time machinists I had known and worked beside, and a mental picture of their hands came to my mind. Strong, capable hands, all of them—but in most cases scarred and battered, some with one or two fingers missing, and in one instance minus three, and I thought how safety education had progressed since the days when a lacerated finger or hand was accepted as part of the day's work—a machinist's red badge of courage, if you will—and there was a vague sort of tradition among members of the craft that a mechanic had not attained full stature unless at least part of a finger was missing.

As I went through the shop, I noticed the beneficial effect of the comparatively short years of safety education, as displayed in the hands of men of the younger generation of shop employees. Yet, not all of them were obeying the instructions on the poster. I passed a milling machine where the operator was pounding the vise handle with the heel of his hand, in order to tighten the grip on the work, bringing again to my memory, hands subjected to years of just such treatment, that were completely ruined for close work where a fine sense of touch was essential.

After all, steady hands are as much of an asset to the skilled machinist as they are to the skilled surgeon, for neither of them can exploit their skill to the fullest if the fine nerves in the hands have been dulled and shattered by abuse.

Even in shops where safety rules are rigidly enforced, you will see instances where the regulations are disregarded and acts of carelessness like the following occur; flicking chips from a rotating milling cutter, or from the path of a moving shaper or planer tool with the fingers; using the index finger to apply lubricant to a high speed drill, without troubling to stop the spindle, or using that same finger to rid the T-slots on a machine table of chips, taking the chance of acquiring some steel splinters.

Of course, the men know better, yet in a slowly diminishing degree the abuses persist. Whether they are inspired by a desire to "cut corners" or through laziness, these practices should be condemned and discouraged. Therefore, I highly recommend posters of the caliber of "Green Hands" which has done much to bring to the attention of workmen and executives the importance of caring for the two best tools a man can have.

Hot Journals on Locomotives

N. F. STRONG

The question of how to avoid hot journals on the trucks of locomotives and tenders is a problem that has caused many master mechanics much grief. However, I believe this problem has been solved by one of the prominent railroads that has been almost free from this trouble since using the fixture illustrated.

After squaring and aligning the trucks in the conventional manner, the boxes are machined central and square with the bearing seats. Although this is supposed to have been the regular practice, it is surprising how many boxes have been found to be out of center and out of square, so much so that in some cases the rocking wedges would not tip enough to keep the bearing in correct alignment.

In designing the fixture, it was decided to arrange it so that the boxes would be held in the same position that they were held on the journals that were to run in them. Fig. 1 shows the empty fixture, Fig. 2 the fixture with a box in place and Fig. 3 gives the details of the fixture. A dummy journal is

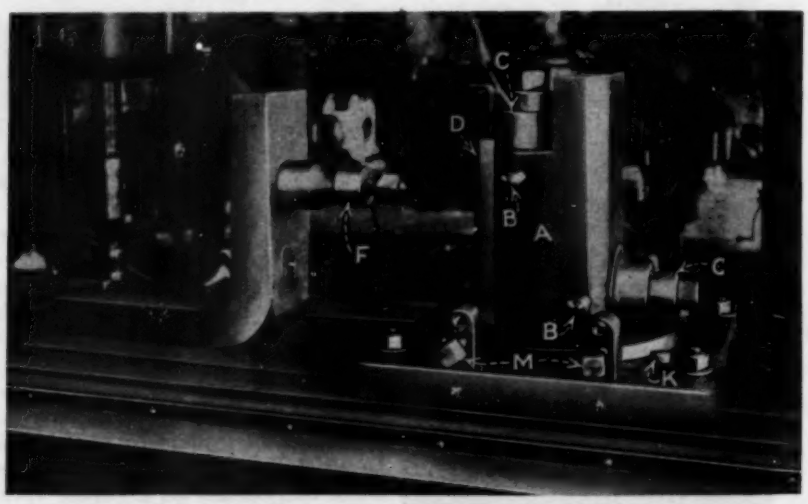


Fig. 1—With this fixture a new engine-truck box can be machined, floor to floor, in 17 min.

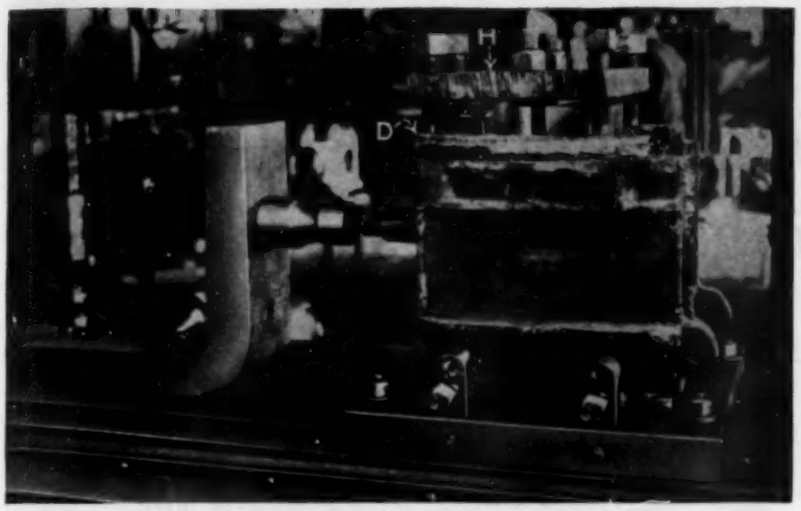


Fig. 2—After a dummy bearing is placed in the box, a jackscrew brings the bearing seat in the box square with the dummy journal

pressed into a base having a tongue to fit the slots in the machine table. The dummy journal *A* is then trued with the base. Expansion pins *B* operated by the screws *C* having taper bodies are arranged central with the dummy journal at both the back and the front. When applying a box for machining, the procedure should follow these definite steps.

A dummy bearing *D* is placed in its seat in the box and is shoved up against the dummy journal by the jackscrew *F*, bringing the bearing seat in the box square with the dummy journal. Screws *C* are then operated to force out the pins *B* until they center the box with the inside bearing surfaces. Clamp *H* is then applied to the top of the box and is held by studs on the dummy journal. When squaring the box on the dummy journal, if it is found that the bottom face of the box is not square with the base, adjusting screws *K* are set up to the box before clamping it, so that it will not be thrown out of alignment in clamping.

In machining tender boxes, it is not necessary to use the front screw *C*, so it is removed. Plate clamp *L* is used on account of the taper faces on the hinged covers of the boxes. Pin nuts *M* having adjusting screws are used when taking heavy cuts on new engine-truck boxes. They fit into holes in the base and the screws are set up against the side of the box to prevent it from shifting after it has been located on the fixture.

Worn tender boxes can be reclaimed by milling out the channel for a steel liner to fit in it, with the assurance that the box will be as good as new. This fixture has the additional advantage of speeding up the work, as a new engine-truck box can be machined, floor to floor, in 17 min. in the milling machine.

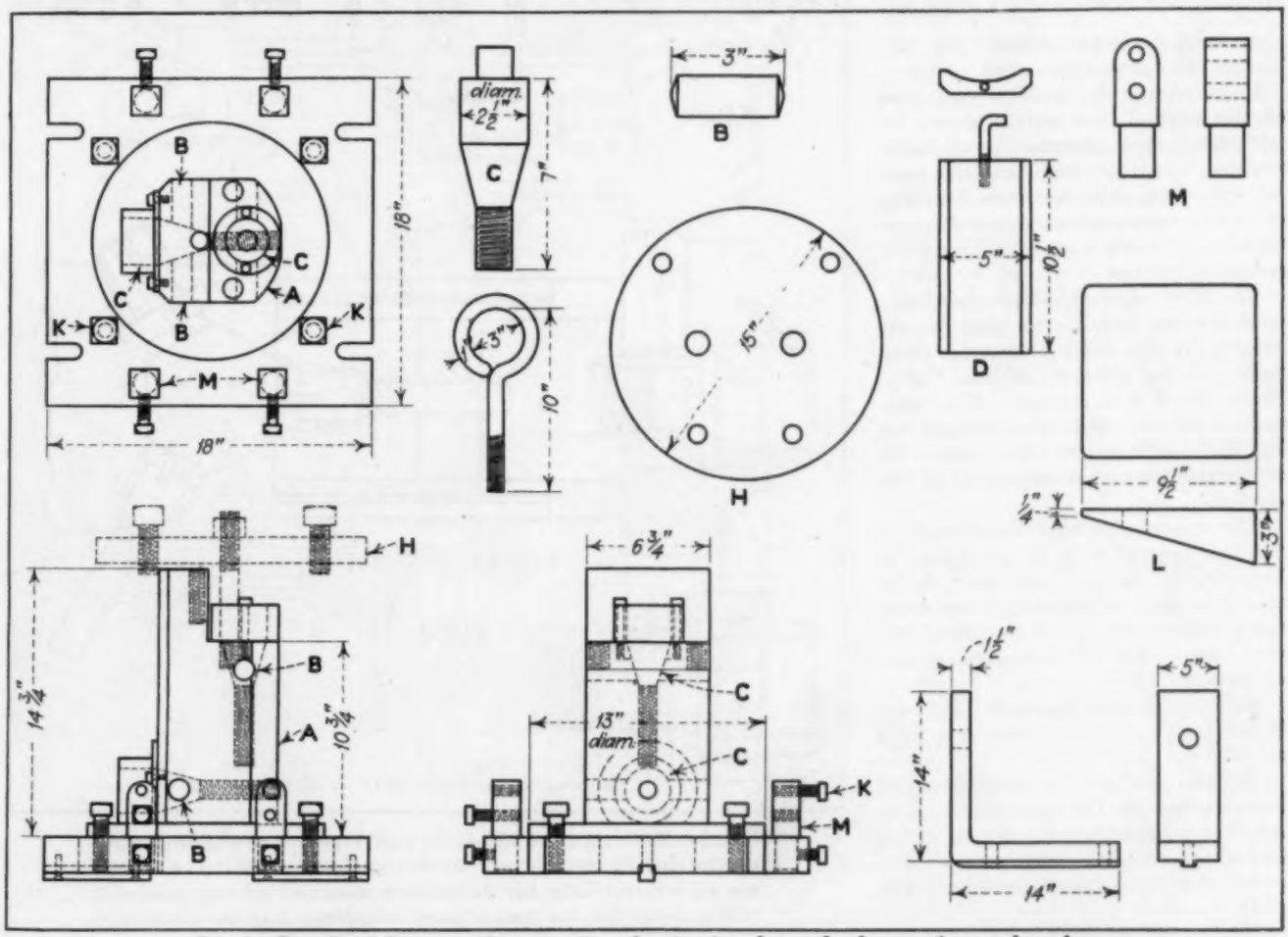


Fig. 3—Details of fixture and accessories adapting it to boxes for locomotives and tenders

Methods for Making Casing and Casing Couplings—II

P. H. BRYANT

In his first article the author outlined the problems facing manufacturers of oil well casing and gave in detail five different ways of forming seamless coupling blanks. He now outlines the methods employed for machining these blanks

●

Method for Machining Couplings

A. Four-operation method (Fig. 3—To produce large sizes only).

In estimating the possible economies of this method, the savings gained by performing each operation on a single-purpose, single-operation machine must be set off against the extra handling costs and rejection losses caused by inaccuracies incident to machining by successive set-ups.

The type of double-taper-travel tap used for the fourth operation was developed by the Bullard Machine Company for the purposes of the United States Steel Corporation. The same type of tap has since been brought out by others using distinctive means for controlling the radial movement of the chasers.

The requirement that the threads in the two tapered ends of a coupling be "continuous" makes it necessary to establish a pitch relationship between the teeth of the two sets of chasers, a feature that doubles the maintenance cost of chasers.

B. Two-operation methods (Fig. 4—Finish-bore and thread one end at a time).

For this method it is practice to use turret lathes for the intermediate sizes, and heavy manufacturing lathes, with a special tap-carrier replacing the tailstocks, for the range of sizes about 8-in. O.D.

Special chucks have to be provided

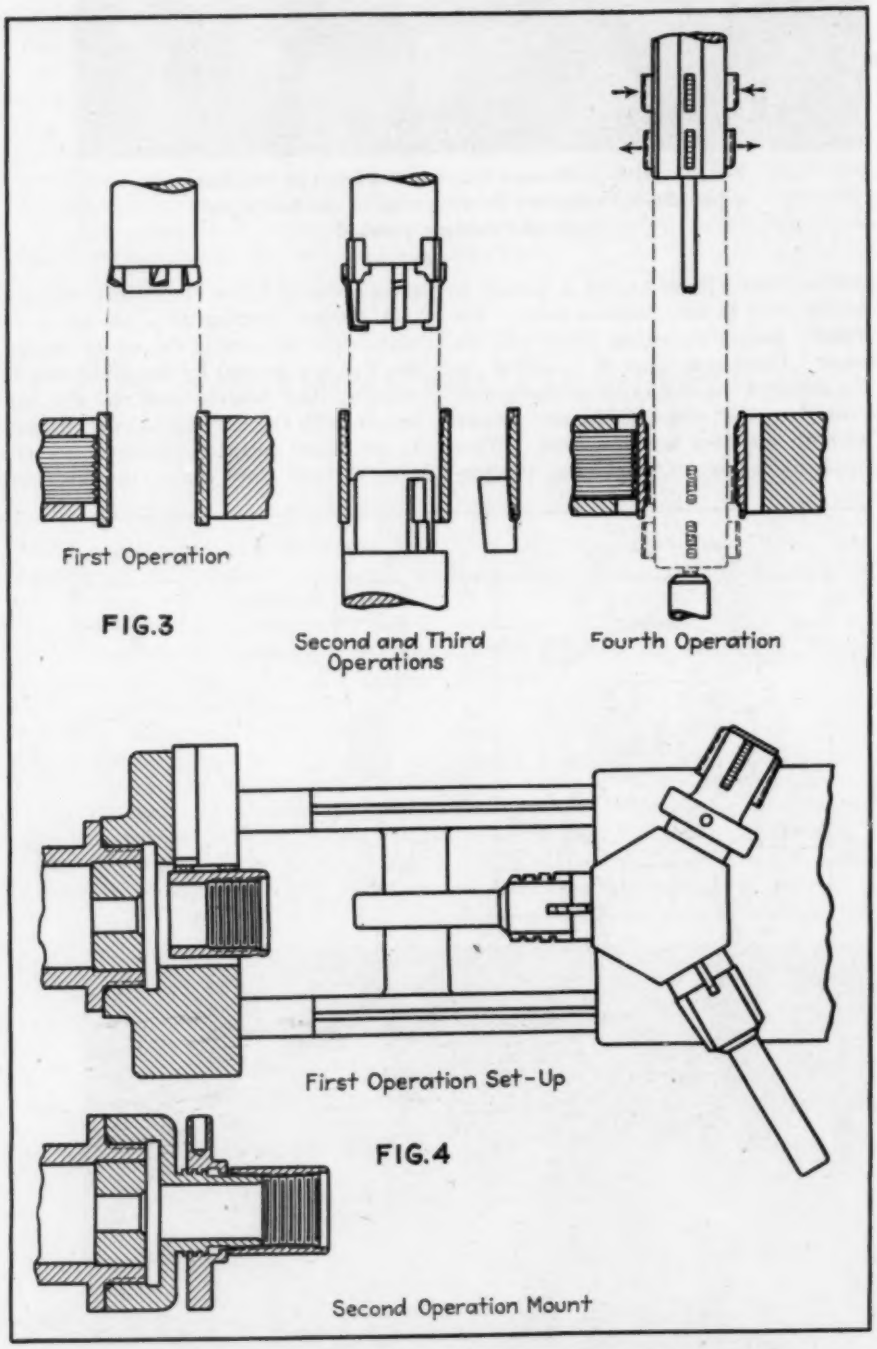


Fig. 3—Machining the blanks in four separate operations entails greater handling costs and increased inaccuracies. Fig. 4—By use of a turret lathe for the smaller sizes and a heavy manufacturing lathe for the larger sizes, couplings may be finished in two set-ups, first machining one end and then the other

for the first operation that will rotate the couplings without slippage during tapping and yet will not subject them to radial pressure sufficient to distort the thin wall of the finished sleeve.

The turnstile bull-ring backing up the screwed-on coupling in the second operation has a course-pitch, L.H. thread and has to be rapped tight with a lead hammer as the slightest creep of the coupling on its mounting nose, after the second thread cut is started, will ruin that thread.

This method has proved the most satisfactory to date for the larger sizes, machined in comparatively small lots. For the intermediate sizes and quantity production, it involves too much handling to be economical.

C. Finish bore both ends and thread both ends in separate operations. (Fig. 5.)

One machine tool builder has developed and marketed a double-end taper boring machine for the first operation. It clamps the coupling on a stationary fixture and taper bores and finishes the ends simultaneously with rotating multiple-tooled boring spindles.

The finish bored couplings are in some instances threaded with double-end taps of the type described above under Method A.

One large independent steel mill controls thread milling equipment and processes, especially adapted to the threading of bored blanks, and is the leading advocate in the industry of milled threads for couplings.

D. Single-operation methods (Fig. 6—Turret machine equipped with indexing chuck).

This method has been extensively and successfully used. It is much faster than machining each end separately, but couplings produced by the method have a greater percentage of rejections caused by the axes of the separate thread cones being out of parallel, or if parallel, not coinciding.

This is caused sometimes by dirt being allowed to accumulate under the locking pin, but more often by a slight movement of the work in the second position because the thrust of the cuts is reversed in direction by changing ends.

E. Double-end turret machine method. (Fig. 7.)

This method has been used for years in various adaptations of standard machines equipped with special chucks and tooling.

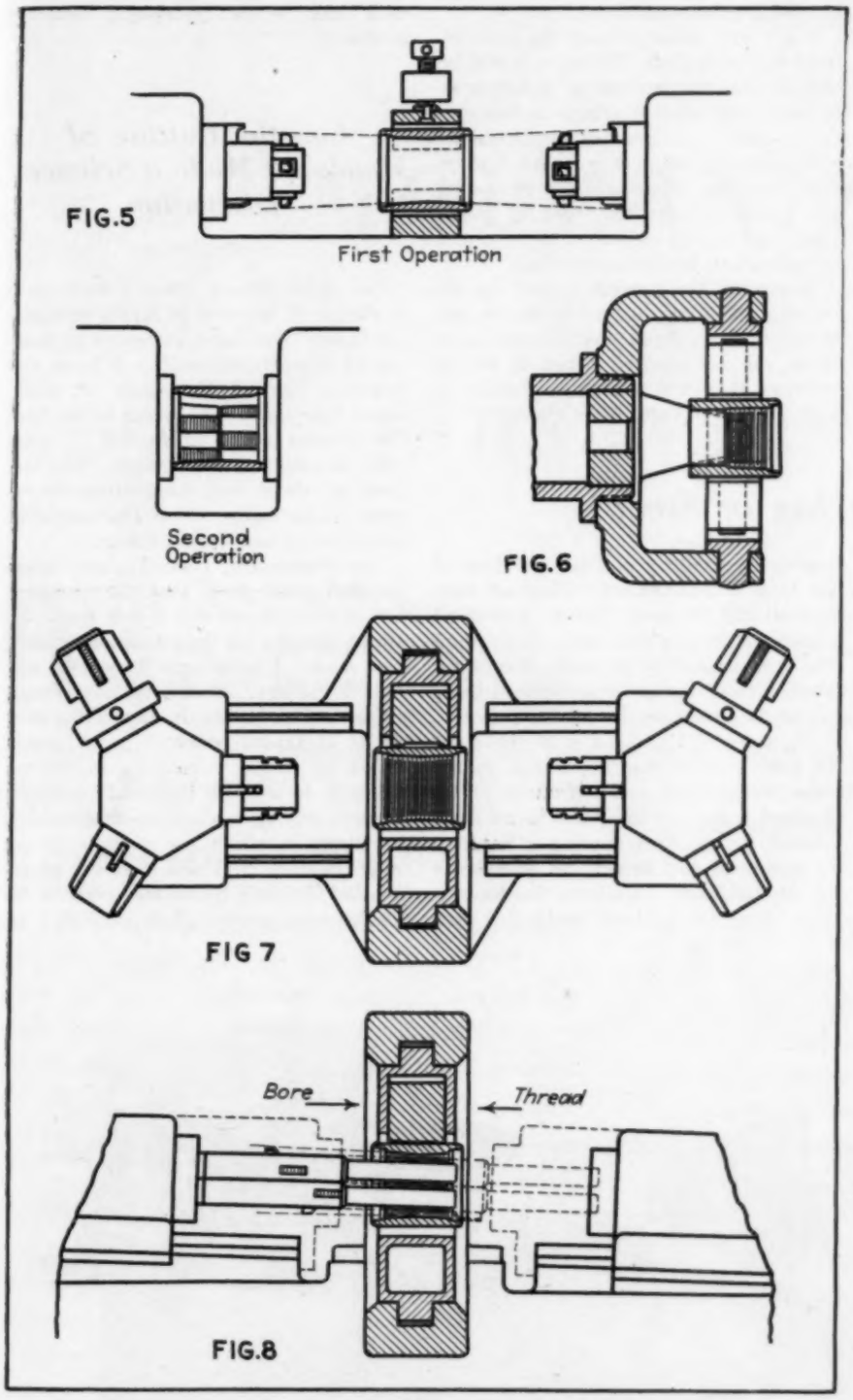


Fig. 5—A special double-spindle machine may be used to bore and finish both ends of the blank simultaneously. Fig. 6—A special fixture which indexes the coupling has been widely used but often results in misalignment. Fig. 7—Special or adapted double-turret machines take up a good amount of floor space but have the advantage of completing the work in one setting. Fig. 8—A double-end single tool head process is fast and accurate when the cuts are fairly light

Finished in One Set-up

It has also been developed in at least two machines designed for the single purpose of boring and threading couplings. The greatest point in its favor is that the couplings are completely finished from their initial setting in the chuck. Its disadvantages are the abnormal amount of floor space taken up per unit of output (because of tool swing of the pair of turrets) and the tendency of the tool heads, when boring eccentric blanks, to spring away from the heavy side, resulting in a misalignment of the two threaded ends.

F. Double-end single-tool head method. (Fig. 8.)

This method was introduced only a few months before the drop-off of production. Its major advantage is that it bores and threads both ends of the couplings with one-piece bars having each end supported close to the work.

Like the previous method, the coupling is held in a type of rotating chuck, but the tool arrangement and sequence of operations is a departure from any other method. The tool bars are equipped with both boring tools and thread chasers. The forward feed bores the double taper, and at the end of the inward feed, the tool bars rotate 90 deg., bringing the thread chasers into position to comb the thread on the return feed.

Couplings machined by this method have well nigh perfect alignment of the two halves. It is an extremely fast and accurate method where there is not too much stock to remove. The very special arrangement of the tools does not permit of readily dividing up heavy cuts, and boring tool up-keep becomes a problem when heavy walled couplings are being processed.

While only processing of the product itself has been dealt with here, it will be obvious that the problem of replacement to raise production standards in this special industry to specified requirements will ultimately require a broad line of supplementary equipment for producing and maintaining tools, working gages, work holding and inspection devices, and equipment to facilitate handling.

Moreover, the present thread specification, will force all producers to use chasers with ground tooth forms, and there will be required types of thread grinders that will enable mechanics of average skill to recondition chasers.

Precision Boring of Steel

Recent examples of precision boring of refrigerator parts (*AM*—Vol. 77, pages 678 and 712) were confined to cast iron, malleable iron and bronze. There are, however, a few cases where steel is bored in a similar manner as indicated by the connecting rod shown on the Ex-Cell-O machine illustrated.

There are four boring units at each end of the machine, these being driven in pairs by 1½-hp. motors shown, each motor being mounted directly above its pair of spindles. The rods are dropped into approximate locators, being finally positioned from four centers and one four-point locating pad on one face of the large end of the rod. They are then hyraulically secured by a four-point clamp on the opposite face. Eight spindles are constantly at work, except for loading time, the gross production being set at 300 rods per hour.

On work of this kind it is important to hold definite size tolerances, roundness, straightness and alignment of the finished holes. It has been found inadvisable to use steels having a hardness in excess of 250 Brinell, 32 scleroscope or 24 Rockwell. Uniform hardness is also important as hard spots dull even carbide tools rapidly in production work.

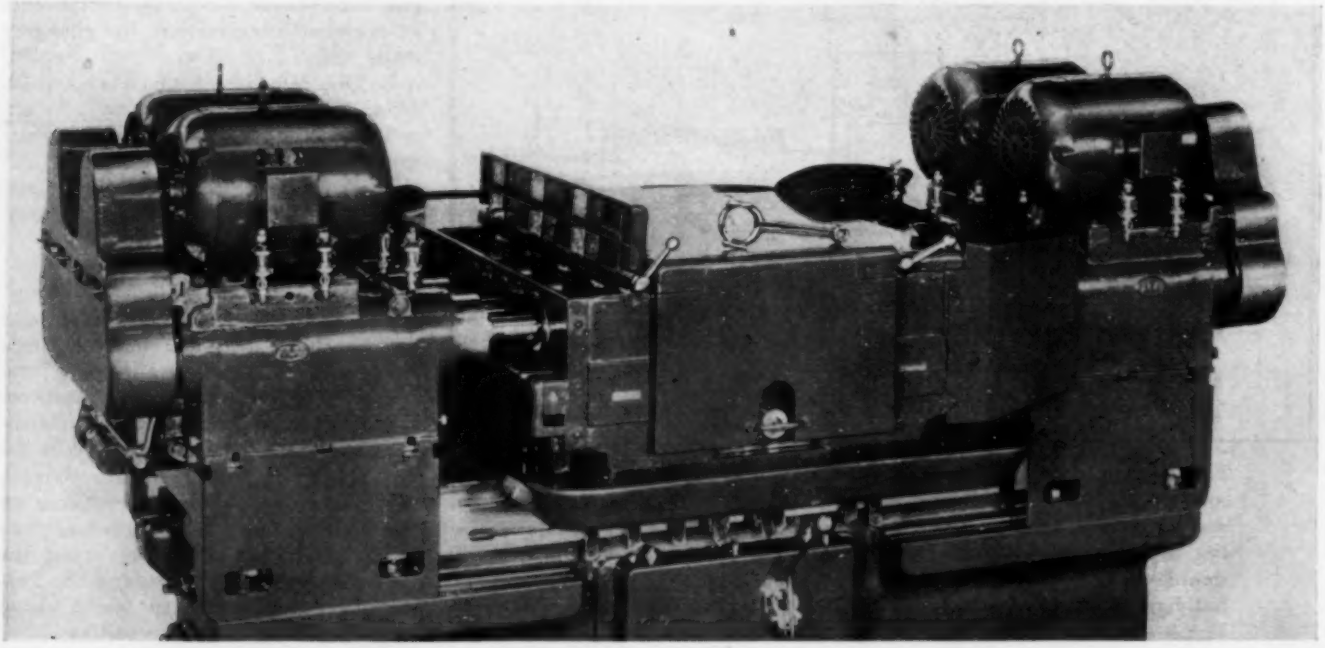
Tantalum-carbide tools are used which remove approximately 0.02 in. of metal with a spindle speed of 750 r.p.m. and a feed of 0.01 in. per revolution. The tool life averages about 600 rods for each tool before re-dressing becomes necessary.

Can the Cutting of Metals Be Made a Science? Discussion

K. M. SINGER

For about fifteen years, I have been in charge of factories in highly competitive trades and have succeeded in beating all competition easily. I have also inspected several thousands of workshops thoroughly. It seems to me that the question asked (*AM*—Vol. 77, page 782) does not need an answer. The fact that my shops beat competitors in various trades easily, shows that scientific management can do big things.

For a standard, I set Taylor's axiom on high-speed steel, that the economic life of tools is one and a half hours between grinds. It has been done in a few cases. I never saw it done in any outside factory. Definitely, any competition can be beaten, in any of the hundreds of trades which I have investigated, by simple, scientific management. There is no need for technical excellence. Is there any shop where cutting carbides are used, in which the average 14 per cent tungsten steel tool is giving 50 per cent of Taylor's figure for speed or for life between grinds? I do not think so.



Tantalum-carbide tools remove 0.02 in. of metal; tool life 600 rods before redressing

EDITORIALS

VOLUME 78 AMERICAN MACHINIST ESTABLISHED 1877 McGRAW-HILL PUBLISHING COMPANY, INC. NUMBER 4

K. H. CONDIT F. H. COLVIN
EDITORS

MODERNIZE *THE ARSENALS*

BY THE TIME the World War came to an end much of the manufacturing equipment in our arsenals was up to date. Dire necessity had forced the rectification of a situation that had been deplorable. Some of the machinery that dated back to the Civil War was replaced by modern units.

But many of the old museum pieces, like the gun stock lathe at Springfield and the big gun lathe at Watervliet illustrated in General Tschappat's article, are still on the job. And, what is more, the new machinery installed during the World War is now decidedly inefficient as compared with current models. It was built, remember, nearly twenty years ago.

We call your attention to those statements in the Tschappat article that summarize the condition of the equipment in each of our six manufacturing arsenals. With the single exception of Picatinny practically no new machinery has been installed in more than fifteen years. And Picatinny fares better only because an explosion eliminated some of its historic junk.

With such equipment how can the Ordnance Department function satisfactorily either as a manufacturing organization or as a laboratory for developing methods of ordnance production? In the first case it is under as great a handicap as any poorly equipped commercial plant. In the second case, and the more important one, it can hardly succeed in working out better procedure if it lacks the modern tools with which to work.

THE ORDNANCE DEPARTMENT has requested the modest sum of a little more than two millions of dollars for the purchase of modern equipment for its arsenals. Our only criticism of the request is that it sounds too modest. Certainly it represents a very small premium to pay for the kind of national insurance represented by preparedness for an emergency.

Passage of the Navy Treaty bill by the House is encouraging evidence of a realistic attitude on the part of that body. Approval of the appropriation for arsenal equipment would be further evidence of the same sort. And every dollar so appropriated would mean employment for skilled men in the still sadly depressed machinery industry.

[AN EDITORIAL]

Export Financing

ENTRY of the Federal Government into the financing of exports through the form of a Government-owned corporation located in Washington, although highly significant of the trend of Administration thought, attracted small attention when Jesse H. Jones, Chairman of the Reconstruction Finance Corporation, announced it ten days ago. It is significant because it evidences the President's determination to foster foreign trade. As Mr. Jones put it, "What we are trying to do is to furnish a bankroll to keep the export game going." And it is doubly significant as an indication of victory for that branch of the Administration which holds that, for the present, Federal funds must constitute the principal source of credit.

It is to be hoped that companies with little or no experience in foreign trade will not rush in and by their blunders prevent this project from achieving the success which its sponsors expect. Money, after all, is not the only essential in export trading. The proper connections abroad and a product adapted to foreign needs are at least as important.

.CHIPS.

Washington—Harry L. Hopkins, emergency relief administrator, announces Administration plan to spend up to $100,000,000 to move technically unemployed and other permanent cases to subsistence farms and rural industrial communities . . . Secretary Perkins comes out for unemployment insurance . . . Roosevelt signs gold bill and sets dollar value at 59.06 cents . . . Issues executive order directing that majority vote shall determine single representation of employees under Section 7 (a) of NIRA . . . Congress passes bill authorizing full "Treaty Navy" with complete aircraft complement . . . McSwain has bill involving $118,000,000 for 3,000 Army planes, machine shops and additional personnel . . . Treasury will build seven cutters in various Navy Yards to chase rum runners . . . Metal Trades Council of Brooklyn yard, which got two, protests award of four to Philadelphia . . . Congress votes $950,000,000 to continue CWA . . . Supreme Court quashes all pending liquor law violation cases . . . Farley cancels all air mail contracts as Senate probe turns up irregularities . . . Scandals portend in Army truck contract investigation.

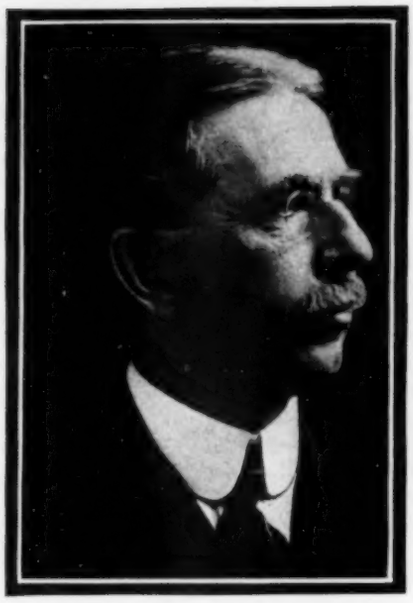
Foreign—Hitler wipes out the German states and intimates that he will organize nation along old tribal lines . . . No Jews allowed to hold any office in Germany but may continue in business . . . Compromise agreement reached by which Germany will pay 77 per cent of interest due on long-term bonds . . . Great Britain and Italy offer new arms limitation proposals . . . Austrian trade mission coming here to improve reciprocal arrangements . . . Russian Communist party cleans house and eliminates 200,000 who failed to come up to standard . . . Nazis issue Teutonized version of the Psalms as further evidence of colossal inferiority complex . . . French riots threaten overthrow of existing government and establishment of a dictatorship . . . Daladier cabinet resigns and is succeeded by one headed by Gaston Doumergue . . . Fascist Heimwehr controls Austria.

Finance—Pecora prepares bill to regulate stock exchanges . . . Stock and bond markets react very favorably to gold bill, prices up and volume heavy . . . Hoarding diminishes and bank deposits rise during first month of deposit insurance bill . . . Flow of gold from abroad increases rapidly and forces dollar quotations up . . . Bond sales set 11-year record . . . 69 closed banks opened in January.

Industry—Atterbury outlines electrification program and projected repair work on P.R.R. based on PWA loan, says it means a year's work for 2,500 men . . . Business improvement adds 13,000 to duPont payroll, or about 75 per cent since low point of 1932 . . . Lehigh & New England and Nickel Plate roads ask PWA loans for new locomotives and cars . . . General Motors may purchase Corrigan-McKinney Steel Co. and Newton Steel Co. . . . Interstate Power places half-million-dollar order for electric ranges and refrigerators with Westinghouse . . . Green charges that automobile manufacturers are evading labor clauses of their code . . . Eaton Manufacturing Co. buys Alloy Spring & Bumper plant at Jackson to enlarge facilities . . . General Electric takes over B-Line Boiler plant in Cleveland for manufacture of new gas-fired boilers for domestic and industrial use . . . Employment in Cleveland highest since May, 1931 . . . Mechanics Educational Society extends its efforts into Ohio . . . Serious shortage of skilled workmen is only a few weeks away . . . Ford raises wages 10 per cent.

Trade—Montgomery Ward mail order sales jumped 80 per cent ahead of last year in January . . . C.I.T. reports doubled business in automobile financing . . . Roosevelt announces plans for export bank to finance foreign trade through loans to American exporters, immediate consideration being given to Russian trade . . . January buying best in three years . . . Exports rose in December . . . Wholesale prices rise for sixth successive week.

Indicators—Carloadings rise . . . Electric power production passes marks of previous week, and corresponding week of 1933 . . . Steel rate rises to 38 per cent . . . *Business Week* index up to 66.1.



James Hartness Dies

The Honorable James Hartness, 61st Governor of Vermont, died on February 2, at his home in Springfield, Vt. By his passing, the machine tool industry loses a figure who contributed greatly to its progress—humanly through his encouragement of young men, and mechanically through his outstanding inventions.

Mr. Hartness was born in Schenectady, N. Y., in 1861. At the age of sixteen he entered his father's trade of machinist, receiving 45 cents for a nine-hour day on his first job. At the age of twenty he obtained a position as foreman in a bolt and nut plant in Winsted, Conn. In 1886 he moved to Torrington where he spent three years as toolmaker and foreman with the Union Hardware Co. Here Mr. Hartness began the long line of inventions which marked his career. In Torrington he also became acquainted with George O. Gridley and Edwin R. Fellows.

Upon the purchase of the Jones and Lamson Co. by Adna Brown of Springfield, Vt., and the removal of its shop to that city, Mr. Hartness was engaged as superintendent. This was in 1889. In three years his policies had resulted in financial success for the firm. The changes included redesign of the old line of turret lathes into the present "flat turret" type and the improvement of its tool equipment. Mr. Hartness concentrated on one size of machine and sold it direct. He instituted the modern practice of artistic and informative sales literature.

William D. Woolson then manager of the firm recognized the abilities of his young superintendent, and when the company was reorganized, Mr. Hartness was assigned a large interest in the concern. In 1896, Mr. Hartness became manager and in 1901, president, a position he held until his retirement a year ago.

An essential part of Mr. Hartness' scheme of life and of his personal achievement has been his influence in encouraging men of ability in his employ to strike out for themselves. Among those who have done so are: George O. Gridley, in what is now the National Acme Co.; the late W. L. Bryant, who was president of the Bryant Chucking Grinder Co. and Fred P. Lovejoy, president of the Lovejoy Tool Co.

Among Mr. Hartness' hobbies were aviation and astronomy. In 1916 he learned to fly the crude and dangerous airplanes of the time, taking the necessary solo flights to gain an amateur pilot's license. His invention of the sheltered observatory, "the turret equational," gained him membership in American and English astronomical societies.

His fellow engineers honored Mr. Hartness by electing him vice-president and later president of the A.S.M.E. In 1924 he was made president of the Engineering Council. Both Yale University and the University of Vermont awarded honorary degrees to Mr. Hartness. He was also the recipient of the John Scott medal.

During the World War he served as Federal Food Administrator under Mr. Hoover and as chairman of the Committee of Public Safety. From 1914 to 1920 he was chairman of the Vermont State Board of Education and from 1918 to 1920 vice-chairman of the Congressional Screw Thread Commission.

• INDUSTRIAL REVIEW •

• Because of increased activity in machine tool plants and the large number of inquiries out it looks as though quick deliveries will be difficult to attain in the near future. Inquiries today represent real potential business, not merely a desire on the part of the prospect to check his costs. Several auto makers have anticipated this contingency by releasing tool orders despite the feeling a few months ago that they could adapt old equipment to their new models. The need of counteracting rising costs under NRA by improved methods is directly responsible for this demand. Other divisions of the metal-working industry are thinking the same way and are expected to act soon.

• Boston has experienced a slight slackening in orders but is still getting a fair volume of business and new inquiries. In the Philadelphia district inquiries show an increase. Pittsburgh seems to be lagging but some new inquiries are reported and this territory hopes to profit from increased steel schedules. Some companies are already handicapped because of the lack of modern equipment.

• Cincinnati found January the best month in two years with the exception of last November. The first week in February was still better with every evidence that the activity would be sustained. Cleveland, too, enjoyed the pick-up in January but has noticed a slight tapering off. Deliveries there are already somewhat of a problem but not to the degree that they are in Detroit where special rush orders are the rule, especially for small tools and supplies. In the motor metropolis, car builders and tool shops are extremely busy, and optimism runs high.

• Both orders and inquiries continue to improve in Chicago and Milwaukee. St. Louis finds inquiries turning into orders and is confident that this trend will continue.

Railroad Purchases Made Possible by PWA Loans

Contracts covering $96,140,000 of the funds allotted for loans to railroads to promote recovery of the heavy industries have been signed by Public Works Administrator Ickes. Among the roads which will benefit from these loans are the Southern Pacific, Chicago and Northwestern, Chicago and Eastern Illinois, Lehigh Valley, New York, New Haven and Hartford, Pennsylvania and the Midland Continental.

Because of an allottment of $12,000,000 to the Southern Pacific, employees will receive 9,819,870 man-hours of additional employment this year; it is estimated that at least twice as many man hours of indirect industrial employment will be created by the production and transportation of materials to be used. This railroad will purchase and lay 40,000 tons of new rails and 1,820,000 cross ties. It will rebuild, repair and modernize 748 locomotives, 3,811 freight cars and 406 passenger cars in its own shops. The entire $12,000,000 will be spent this year.

A loan of $1,400,000 to the Chicago & Northwestern Railroad will enable it to purchase 26,514 tons of new rails, 1,460 tons of standard rail joints and a large quantity of other rail fittings. These will be laid at various places between Chicago and Council Bluffs and on the lines between Chicago and Milwaukee, and Chicago and Elroy, Wis. It will replace much old rail that is unsafe for high-speed operation.

Nearly 3,000 railroad shopmen will be employed on work being done by the New York, New Haven and Hartford, Pennsylvania and Lehigh Valley Railroads because of loans they have received. The Lehigh Valley has put 1,000 shopmen back on a five-day week at Sayre and Packerton, Pa., with a loan of $2,000,000 made for repairing 2,600 box and coal cars. This repair work will provide approximately 929,000 man-hours of employment. An additional allotment to the Lehigh Valley will be used for the purchase of five new locomotives, the manufacture of which will create 112,000 man-hours of direct employment.

Seven hundred shopmen employed by the New Haven are at work on the job of rebuilding passenger and freight cars, being paid from a $3,500,000 loan. The Pennsylvania has put a total of 1,200 men to work in its shops at Altoona, Pa., its Enola shops near Harrisburg, and its Pitcairn shops near Pittsburgh. These men will commence building 7,000 new freight cars which are a part of the equipment building and electrification program on which the Public Works Administration will advance $77,000,000 this year.

The Chicago & Eastern Illinois Railway will purchase 4,000 tons of rail, and corresponding amounts of tie plates, spikes and other fittings, through a loan of $240,000. Because of the decline in earnings since 1929 the road has not been properly maintained with the result that its track forces have lost much employment and a substantial amount of the rail in its high-speed main tracks is surface-bent and some is curve worm. The Midland Continental Railroad, a short line in the Northwest, purchased a new engine through a loan of $40,000.

German Machine Builders Face Difficulties

German machinery interests contend that unless substantial relief is soon obtained a considerable shrinking in the size, efficiency and prominence of the domestic machine building industry is imminent. This industry, which is made up largely of small and medium-sized enterprises, still shows an unemployment level of more than 40,000, many of whom are highly skilled workmen. Many plants which have been erected to meet the prosperity demand have already been closed.

The competition of second-hand machinery is one of the difficulties with which the German machine builders have to contend. While to some extent this is accepted as inevitable, manufacturers complain that large industrial enterprises profiting directly or indirectly from government orders should purchase new instead of second-hand equipment.

German machinery exporters are being urged to engage in large-scale advertising to spread propaganda as to the desirability of German machinery to foreign buyers. Machinery exports in the past have accounted for approximately one-third of Germany's export trade. It is estimated that machinery stocks on hand of machine tool builders approximate 55,000 metric tons valued at 100,000,000 reichsmarks.

Bethlehem Starts Naval Ship Construction

Keels were laid recently at the Bethlehem Ship Building Corporation, Fore River, Mass., for four naval ships: heavy cruiser U.S.S. Vincennes, 10,000 tons and three 1850-ton destroyers, U.S.S. Phelps, U.S.S. Clark, U.S.S. Moffett. Funds for the construction of the cruiser were allocated to the Navy by President Roosevelt under the National Industrial Recovery Act. Funds for the destroyers were authorized for increase of the Navy by the Appropriation Act for 1934. The contract for the cruiser construction, made for the fixed price of $11,720,000 without adjustment for change in labor and material costs, was signed by the Secretary of the Navy Swanson, September 1 last. Contracts for the destroyers for the fixed price of $3,896,000 each were signed the same day. These destroyers are replacements for vessels which became over age in 1933.

William P. Cooke Appointed to Code Authorities

Succeeding Neal W. Foster as administration representative, William P. Cooke has been appointed to the code authority for the Pump Manufacturing, Heat Exchange, Compressed Air and the Plumbago Crucible Industries.

Metal-Working Code Hearings Scheduled

Date	Place	Deputy Administrator	Association
Feb. 15	Mayflower Hotel	Paddock	Writing Instruments
Feb. 16	Willard Hotel	H. O. King	Forged Tool Society
Feb. 16	Willard Hotel	H. O. King	Snap Fastener
Feb. 16	Willard Hotel	H. O. King	Wire Cloth Manufacturers
Feb. 16	Commerce Bldg.	H. O. King	Staple Association of America
Feb. 20	Willard Hotel	G. S. Brady	American Gear Manufacturers (objections)
Feb. 20	Raleigh Hotel	R.W.Murphy	Counter Freezer Manufacturers
Feb. 26	Willard Hotel	G. S. Brady	Manufacturers, Recoverers and Repairers of Cylinder Molds and Dandy Rolls

Industrial Machinery Exports Decline, Implements Gain

According to figures compiled by the Department of Commerce, United States exports of industrial machinery in 1933 showed a 6 per cent decline from 1932. The total sales abroad in this division last year were valued at $55,282,687 against $58,490,503 in the preceding year. The 1933 sales were approximately 68 per cent under those for 1931.

In only two classifications, namely, "mining, well and pumping machinery" and "textile, sewing and shoe machinery," were increases recorded. Shipments in the former group reached a total of $13,500,000, a gain of 28 per cent over the preceding year's figures, while for the latter, the total amounts to $9,825,000 or 4 per cent over the 1932 total. Textile machinery exports alone reached a value of $4,860,000 in 1933, an approximate gain of 13 per cent.

The greatest loss recorded for industrial machinery exports in 1933 occurred in power-driven metal-working machinery, the total of $8,158,000 being 32 per cent under the 1932 figure. Of the remaining classes, exports of power-generating machinery, except electric and automotive, decreased 23 per cent, with total exports in 1933 amounting to $3,845,000. Construction and conveying machinery exports valued at $2,813,000 were nearly 27 per cent under the 1932 total. Other metal-working machinery and other industrial machinery showed export valuations in 1933 of $1,211,000 and $15,926,000 respectively, the former being 24 per cent under the preceding year's total while the latter showed a negligible decline.

These figures show that machinery exports reached a low point during 1933. If monthly figures are used instead of annual figures a substantial recovery is already shown. The peak of these exports occurred in March, 1929, reaching a figure of $25,645,339. The low point was reached in May, 1933, with exports of $3,400,060. Since that time there has been almost consistent improvement, the high being in November at $6,743,348. December was just a little lower at $6,317,808, showing that export business in this classification has almost doubled since the low point of the depression.

Contrasting with foreign shipments of industrial machinery, a 16 per cent gain was registered in exports of agricultural implements in 1933. These shipments reached the total of $12,210,948 compared with $10,764,309 in 1932. The improved showing over the preceding year was caused by increased exports during the closing months. The foreign shipments for the last half of the year were valued at $6,781,674 against $5,430,285, for the first six months.

December recorded the largest monthly export total with shipments having a total value of $1,446,639, an increase of 80 per cent over the corresponding period of 1932.

Metal Congress to be Held in New York

For the first time the National Metal Congress and Exposition will be held in New York City during the week of October 1-5, 1934. The Commerce Hall in the Port of Authority Building has been chosen for the site of the exposition.

All exhibits will be located on one floor with about 160,000 sq.ft. of space available. There are no restrictions as to floor loading or operation of exhibits. Floor plans are to be available about March 15.

Special Tool, Die and Machine Shop Institute Holds Cleveland Meeting

With 499 active members, five local groups on the Pacific Coast signed up and 2,300 prospects, the recently formed Special Tool, Die and Machine Shop Institute conducted a successful first meeting at Cleveland on Feb. 5. The following officers were elected: J. J. Kohl, Dayton, Ohio, president; H. A. Stoddard, New York City vice-president; G. A. Barth, Cleveland, Ohio, secretary-treasurer; Roy T. Wise, Berkeley, Calif., managing director. The Institute office, where Mr. Wise has his headquarters, is at present in the offices of the American Society for Metals, 7016 Euclid Ave., Cleveland.

In his opening remarks President Kohl pleaded for patience and tolerance, urging those present to carry this message back to their local groups. He pointed out that although great strides have been made through NRA in the last half year in bringing order out of the chaos that characterized the tool and die industry, there is still much to be done before the new business ideals replace the old custom of "each man for himself, and the Devil take the hindmost."

Reporting for the Institute's Code Committee, F. S. Blackall, Jr., of Woonsocket, R. I., stated that the NRA code finally approved, although not all that had been hoped for, was still a far better code than seemed possible to obtain when the hearings were in progress. The necessary provisions to control unfair trade practices are available and steps are being taken to set up the machinery for handling labor questions. Despite the warning of Joseph Dilworth, assistant deputy administrator representing the government on the Institute code authority, that a reopening of code hearings made attack on any provision of the code possible, the members voted instructions to their code committee to reopen the code in an endeavor to restore the clause specifying an average minimum hourly rate of 70 cents for skilled labor on special tool, die, fixture, jig, pressure mold, and engineering and development work, which was eliminated at the final hearing. The code authority was requested to ask NRA for an official statement on the obligation resting on every company or unit in a given industry to pay its fair share of the costs of administering the code of that industry.

New Eagle Appears

In order to distinguish concerns operating under NRA codes from those operating under the President's Reemployment Agreement, a code Blue Eagle has been prepared. The emblem, which is to be distributed soon, has under the talons the word "code" followed by the industry's registration number. This new emblem indicates that an employer has guaranteed his workers decent working hours and living wages and in addition has bound himself to the maintenance of a rigid standard of fair trade practices.

Clock Concern Makes Safety Record

An unusual achievement of safety in a large industrial plant was made by the Western Clock Company, which went two years covering 6,500,000 man-hours without a single lost-time accident. In recognition of the importance of employee cooperation in safety work, the company declared a half holiday at full pay on January 12.

British Machine Exports Fall in 1933

LONDON—Statistics compiled by the British Board of Trade for the year 1933 give imports valued at £675,847,365, with exports of United Kingdom goods at £367,423,909, and exports of imported merchandise at £49,077,553. The total exports amount to £416,501,462; the excess of imports is £259,345,903. The corresponding figures for 1932 gave an excess of more than 287 million pounds.

Any satisfaction that may be felt will be tempered when it is recalled that, whether for imports, exports or re-exports, last year's figures were only about one-half those of four or five years ago. With lessened trading comes, of course, a smaller need for shipping and consequently for shipbuilding.

As compared with 1932, imports showed a decline of £25,822,696. In articles wholly or mainly manufactured, the chief declines were £2,537,565 in iron and steel and their manufactures and £1,906,535 in machinery, with a fall of £577,600 in the vehicles class. The only increase that need be mentioned here is £931,547 in non-ferrous metals and their manufactures.

Exports at £367,423,909, showed a net increase of £2,399,901, which included an increase of £4,885,263 in the wholly or mainly manufactured class. The chief increase was in non-ferrous metals and their manufactures amounting to £5,254,603. There was also an increase of £1,876,589 in iron and steel and manufactures thereof; of £913,787 in electrical goods and apparatus and of £872,270 in the vehicles class. But machinery showed a decline of £2,489,169.

An accurate account of the output of the British machine-tool industry is not available, but last year was not without its satisfactory periods for which home demand was mainly responsible. There was, in fact, a definite fall in the weight and value of exports of this class, with some decline in imports and a slight increase in re-exports. The table shows the distribution of these exports both as to weight and value. The total here given is the amended value as shown by later returns obtained through our London office. The decline from the 1932 exports of £3,144,124 may be accounted for by the fact that machine tools in 1933 were sent to Russia valued at £623,314, as compared with £2,552,947 in 1932 and £1,434,207 in 1931.

Lathes were sold to the value of £400,659, or very nearly a third of the total. Grinding machine exports were valued at £252,464, or about a fifth of the total, the nearest figure after this being for drilling machines amounting to £127,272.

Distribution of British Machine Tool Exports—1933

	Tons	£
To Soviet Union (Russia)	4,096	623,314
Other European countries	899	159,684
Union of South Africa and Southwest Africa territory	518	62,490
British India	1,446	139,093
Australia	307	43,754
Other countries	1,634	238,445
	8,894	1,266,082

Machine tools to the value of £152,119, or about an eighth of the total, are unspecified as to type.

Imports of machine tools declined, being valued at £848,661 as compared with £968,379 in 1932. The largest item was for grinding machines at £122,612, with lathes next at £74,752, and milling machines at £62,530.

The improvement in trading has been in the home market. The tendency of overseas areas to manufacture what they previously bought forms a handicap to export, quite apart from the restrictions and obstructions raised to trading between country and country.

Plan Outlined for Export Finance

According to a statement at a recent press conference by Jesse H. Jones, chairman of the Reconstruction Finance Corporation, the administration is trying to find a way to finance exports and possibly imports to Russia and to some other countries. In discussing the tentative plan Mr. Jones outlined means by which it might be effected, but also pointed out a number of difficulties.

The foreign trade bank, for which exporters have been fighting for months, is to be a government institution, under the R.F.C., like the Commodity Credits Corporation, with all the R.F.C. money needed (the exporters thought of thirty million dollars capital, three hundred million dollars debentures, all but five millions to come from R.F.C. anyway) and with a government guarantee without recourse of an agreed proportion of the credit risk. It will not be formed under the Edge Act, but under the relatively generous provisions of the District of Columbia banking law, so set up that the government can under the law buy all the stock, furnish all the money.

It is not expected that any amendments or new funds will be needed from Congress, all can be done within the present resources of the R.F.C. and of the President's budget message. The exporters and importers will only have to sell (or buy) the goods, tell their tale to the new bank, get the money they actually need to put over the deal. The plan is to keep imports and exports balanced as to countries.

Russia, the immediate problem, will push the bank organization through, but it will be empowered to work in all countries. The Russian problem differs from that of other countries, but this will probably be taken care of by finding a way to loan Russia a credit (not to leave this country) for purchases here, to be balanced by imports to be worked out.

The new bank will have an early effect, it is hoped, on exports not only of agricultural goods, but of machinery, thus tending to relieve directly the harassed capital goods industries. It is taken in Washington as a direct turn to the promised attention to foreign trade promised "when the time comes" to foreign trade in the President's inaugural address.

General Johnson Stays Code Price Provisions

Administrator Hugh E. Johnson recently announced that he will not approve provisions in codes which prescribe a time limit before the prices filed become effective. The text of an order issued by General Johnson to this effect is as follows: "Pending completion of a study of open price associations now being made as a result of the price change hearing, no further provisions which prescribe a waiting period before the prices filed become effective will be approved in codes. Therefore, where such provisions are included in proposed codes not yet approved, they shall be stayed in the Executive or Administrator's order of approval for sixty days or pending completion of the aforesaid study.

"This order is not intended to prohibit or stay provisions for open price associations which provide that revised prices shall become effective immediately upon filing."

Henry M. Halsted, Jr. Joins Foundry Group

On February 8, Henry M. Halsted, Jr., resigned his position as assistant deputy administrator of NRA to become executive vice-president of the Gray Iron Founders Society. With Arthur J. Tuscany as executive secretary, he will have charge of the administration and organization of the gray iron founders jobbing industry. The offices of the Gray Iron Founders Society will remain in Cleveland.

Labor Bargaining Based on Majority, NRA Rules

An order, recently issued by the President, authorized the National Labor Board to determine if a "substantial majority" of the workers of a plant wanted an election to choose representatives for collective bargaining under codes and if so to hold elections in its own way. This was his answer to the Weirton difficulty which threatened to turn into a lawsuit and to the Budd case which, like Weirton, held that the workers were well and happy under their company union.

It brought a quick reply from the American Iron and Steel Institute, which showed its full support of the Weirton and Budd contention, roundly assailing an NRA press release which had said that the President's order was a "direct result of the growing tendency on the part of industrial management to build up 'company unions' in their plants" and adding that "these unions were operated by employees' representatives chosen by the employer rather than by the employees themselves."

General Johnson endeavored to offset this by referring to the statement as "an erroneous press interpretation," saying that the order was meant to give full authority to the National Labor Board's decision and that the only practicable way for providing collective bargaining under NRA's Section 7a was to have elections and consider the workers chosen at such elections as the representatives of the workers' own choosing. The defense of the plan is that it alone seems practicable to NRA and the National Labor Board, but the executive order and the two interpretations from NRA set the matter sharply into relief and commit the administration to the interpretation that the majority rules in collective bargaining. As a result of the executive order Labor Board representatives went at once to Wierton and began a canvas to find out how the 10,000 employees felt about holding an election.

Washington Plans To Aid Industrial Finance

WASHINGTON—A concentrated study of the possibilities of direct government guarantee for industrial loans is now under way. It is the first time that the problem has been faced as a broad issue; other efforts to bring it to the front have been with a thought of relief to the capital goods industry, the small factory and the merchant whose working capital has been exhausted by his efforts to do his part under the code.

A committee, which held its first meeting in Washington recently, consisted of representatives of NRA, of the banking and investment interests and of experts from the field. The meeting was held under the joint chairmanship of Division Administrator Arthur D. Whiteside, who is president of Dun & Bradstreet, and Colonel Robert H. Montgomery, new chief of the division of research and planning of NRA.

The Reconstruction Finance Corporation has been facing the problem of help to industry for some time. It has had liaison officers at NRA for weeks, but it has regarded the problem as belonging to NRA which has the facilities to get data and to digest them. What is needed according to industry is a federal discount corporation taking two-name paper (the buyer's and the seller's), allowing expenditures among other things for equipment, and running three to four years. If the government will take up the risk that now has to be carried through commercial credit corporations, which heavy charges, it is believed the problem will solve itself.

While NRA is making this study in the name of the small industries, which for the moment occupy the center of the stage and the friendly interest of Congress, the attitude is far more comprehensive and is a drive at the very heart of the recovery problem of furnishing the capital needed to restore depleted working funds and reserves and to allow modernization of plants which alone can revive the capital goods industry. The automobile industry's previous belief that it would need no new equipment for years was blasted when the new models began pouring from the design room. Now the rest of industry is looking for the means to meet the similar problem of new design and lower costs.

State Legislation Planned to Retain Labor Gains

Administration patrons of labor have set about making permanent the gains made for labor by the National Recovery program. Upon the states, rather than the federal government, they rely for legislation to establish enduring standards of wages and hours, unemployment insurance, old age pensions, industrial health and accident compensation and other measures that, if shouldered by the federal government, may be challenged as unconstitutional.

"But in state legislation," said Isador Lubin, chief of the Bureau of Labor Statistics, "we have an open-and-shut case."

To rouse the states to action, Secretary Perkins has called into conference in Washington, Feb. 14-15, state government and state labor federation officials. Industrial representation is not invited. Employers will have an opportunity to voice their sentiments before the state legislatures later.

Concerted action by the states is the prime objective. As more than 40 legislatures meet in regular session next year and special sessions are likely in others, Secretary Perkins and Senator Wagner are confident that a comprehensive labor welfare system can be set up within the next two years.

State action will render unnecessary the attempts, so often frustrated by the courts, to make federal laws stand up. But some legislation by Congress may be deemed desirable to help the states to carry through their own programs. In this category is the Wagner-Lewis unemployment insurance bill. This bill would assess a federal tax on all employers, amounting to 5 per cent of their payrolls after July 1, 1935.

Jesse I. Miller Made Labor Board Director

Because of the marked increase in the number of cases referred to him by the Regional Labor Board, Senator Robert F. Wagner announced the appointment of Jesse I. Miller as executive director of the National Labor Board, in which capacity Mr. Miller will exercise complete administrative functions.

Mr. Miller, who is an attorney of Washington, is volunteering his services. During the war he was aide-de-camp to Major General E. H. Crowder, provost marshal general and judge advocate general.

Committee Studies Effect of NRA on Small Industries

A committee appointed by Gerard Swope, chairman, Business Advisory and Planning Council for the Department of Commerce, is now studying the actual effects of the application of the National Recovery Act upon the small industries. Membership in this committee consists of Henry S. Dennison, chairman, president of the Dennison Manufacturing Co.; Ralph E. Flanders, president of the Jones and Lamson Machine Co., and Morris E. Leeds, president of Leeds and Northrup. In order that the precise causes of damage and the circumstances of each case be known, the committee requests that specific and detailed reports of such cases be brought to its attention. They may be mailed to Thomas R. Taylor, Room 4823, Department of Commerce Bldg., Washington, D. C. It is hoped that some preliminary conclusions will be reached shortly.

CORPORATION • REPORTS •

American Brake Shoe & Foundry Co.

For 1933, net earnings, $986,692; for 1932, net earnings, $257,370.

Auburn Automobile Co.

Year ended Nov. 30, net loss $2,307,973; previous fiscal year, net loss $974,751.

Bastian-Blessing Co.

Year ended Nov. 30, net loss $107,673; previous fiscal year, net loss $423,844.

Black & Decker Mfg. Co.

Year ended Sept. 30, net loss $683,610; previous fiscal year, net loss $798,312.

Caterpillar Tractor Co.

For 1933, profit $302,716; for 1932, loss $1,616,872.

Cockshutt Plow Co., Ltd.

Year ended Nov. 30, loss before depreciation, $869,732; previous fiscal year, net loss before depreciation and doubtful accounts, $292,151.

Crocker-Wheeler Electric Mfg. Co.

For 1933, net loss $123,531; for 1932, net loss $429,278.

Crosley Radio

Nine months ended Dec. 31, net profit $344,452; same period 1932, net loss $255,231; December quarter, net profit $175,647; preceding quarter, net profit $64,894.

General Railway Signal Co.

For 1933, net loss $24,119; for 1932, net income $634,665.

Holland Furnace Co.

December quarter, net profit $16,404; same quarter 1932, net loss $398,671.

Landis Machine Co.

For 1933, net loss $76,730; for 1932, net loss $149,704.

Lima Locomotive Works

For 1933, net loss $646,893; for 1932, net loss $890,537.

Lunkenheimer Co.

For 1933, net profit $36,951; for 1932, net loss $680,284.

Minneapolis-Honeywell Regulator Co.

For 1933, net income $831,240; for 1932, net income, $190,323.

Reliance Mfg. Co.

For 1933, net income $789,155; for 1932, net income $236,217.

Remington Rand, Inc.

Fourth quarter, net profit $444,000; fourth quarter, 1932, net loss $381,207; nine months ended Dec. 31, net profit $554,000, nine months, 1932, net loss $1,683,036.

Royal Typewriter Co., Inc.

For 1933, net profit $149,017; for 1932, net loss $423,668.

Savage Arms Corp.

For 1933, net loss $236,325, for 1932, net loss $349,373.

Servel, Inc.

Year ended Oct. 31, deficit $493,399; previous fiscal year, net loss $777,433.

Stinson Aircraft Corp.

Year ended Nov. 30, net loss $142,653; preceding fiscal year, net loss $159,360.

Transue & Williams Steel Forging Corp.

For 1933, net loss $125,061; for 1932, net loss $142,673.

Wayne Pump Co.

Year ended Nov. 30, net loss $319,657; previous fiscal year, net loss $262,767.

York Ice Machinery Corp.

Year ended Sept. 30, net loss $840,500; previous fiscal year, net loss $527,040.

• BUSINESS ITEMS •

The Reed-Prentice Corp., Worcester, Mass., has appointed J. C. Austerberry's Sons, 684 East Congress St., Detroit, Mich., as agent for the Detroit territory.

The South Bend Lathe Works, South Bend, Ind., has appointed the W. B. Rapp Machinery Co., 132 North 3rd St., Philadelphia, Pa., as representative in that city and surrounding counties.

On January 1 the Air Reduction Co., Inc., New York, exercised its option on the balance of the capital stock of the Wilson Welder & Metals Co., of North Bergen, N. J., and thus becomes the first of the oxyacetylene welding companies to own completely an electric welding organization.

• PERSONALS •

FRANK C. MACMILLIN has been elected president and general manager of the Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, manufacturers of hydraulic presses and equipment. Mr. MacMillin has been with the company for 32 years, most of this time in the capacity of executive vice-president. Mr. MacMillin's son, HOWARD F. MACMILLIN was elected vice-president and assistant general manager. The latter has been with the company since 1921.

F. T. MOORE, works manager of the Colt Patent Fire Arms Mfg. Co., Hartford, Conn., has been elected a director to fill the vacancy caused by the death of W. H. PENFIELD.

C. R. MESSINGER, head of the Oliver Farm Equipment Co., has been elected president of the Chain Belt Co., Milwaukee, succeeding the late C. F. MESSINGER, his brother. He was also made chairman of the Oliver company.

F. J. SIKOROVSKY was re-elected president and treasurer of the Ampco Twist Drill Co., Jackson, Mich., at a recent directors' meeting. E. R. YOUNG was re-elected vice-president, and C. L. JACOBS, secretary.

GEORGE K. VIALL, vice-president of the Chain Belt Co., Milwaukee, Wis., has been elected a director to succeed the late CLIFFORD F. MESSINGER. Mr. Viall joined the company in 1921 as assistant to the president and subsequently became works manager and then vice-president.

ALBERT J. VITS, executive vice-president of the Aluminum Goods Mfg. Co., Manitowoc, Wis., has been made president to succeed the late GEORGE VITS, his brother. H. L. VITS, vice-president and general superintendent, has been elected to the board of directors.

ARTHUR YOUNG, secretary, Industrial Relations Counselors, is now vice-president in charge of industrial relations for the United States Steel Corporation. He formerly did similar work for the International Harvester Co.

• MEETINGS •

AMERICAN SOCIETY FOR TESTING MATERIALS. Regional meeting—symposium on outdoor weathering of metals and metallic coatings, March 7. Wardman Park Hotel, Washington, D. C. Annual meeting, June 25-29. Chalfonte-Haddon Hall, Atlantic City, N. J. A. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

OIL BURNER SHOW. Eleventh national, March 5-9. Commercial Museum, Philadelphia, Pa. HARRY F. TAPP, executive secretary, American Oil Burner Association, 342 Madison Ave., New York, N. Y.

WELDING CONFERENCE. Third annual, Feb. 28-Mar. 1. Sponsored by department of industrial engineering, Ohio State University, Columbus, Ohio. Communicate with O. D. RICKLY, assistant professor of industrial engineering.

American Machinist
REFERENCE BOOK SHEET ©

Data on Setscrews and Capscrews

Setscrews—Holding Power and Recommended Sizes

These tables were compiled by a leading firm of engineers for the Allen Manufacturing Company through whose courtesy the tables are reproduced. They are based on the use of a hardened setscrew against softer metal. Failure occurs when the setscrew shears the metal, provided the setscrew indents the metal. Increase in hardness of the metal implies increased shearing strength but decreased indentation, the one practically offsetting the other.

Setscrew sizes are selected for ordinary applications on the basis that the shaft diameter shall be four to six times the diameter of the setscrew.

Capscrews—Recommended Tightening Force

The weakest point in a capscrew, rationally designed, should be at the minor diameter of the thread. Common practice among users requires a square shoulder under the head. This leads to a stress concentration at this point that may locate the plane of critical stress.

The purpose of a capscrew is to bind together, or hold together, two objects. From that standpoint, the stress in a capscrew is simple tension. However, the binding action is secured by tightening the capscrew within engaging threads, hence, in addition to the tensile stress there is present a torsional stress of considerable magnitude. In the case of carelessly tightened capscrews, particularly in the common screw stock varieties, the heads are often twisted off. Bending stress may also be present, and for such cases the reader is referred to standard engineering handbooks.

For equipment involving high stress application of capscrews consideration should be given to capscrews with fillets at juncture of the body and head. Information concerning the stress concentration under the head with various fillet radii can be obtained from the use of the chart and the table "Factors for Stress Concentration in Capscrews."

Example: What is the stress under the head of a ½-in. capscrew, with 3/32 in. fillet, when sustaining a tensile load of 50,000 lb. per sq.in.?

The ratio of head diameter to shank diameter, D ÷ d, is 1.50: therefore use upper curve of chart. The ratio r ÷ ½ d for 3/32 in. fillet is 0.125. Trace the vertical ordinate 0.125 to intersection with curve marked 1.50. Thence trace horizontally, where the value 1.57 is found. Stress concentration under head is 1.57 × 50,000 lb. per sq.in., or 78,500 lb. per sq.in.

Had the designer's original problem been that of determining the number of capscrews to use in a die for a press rated at a pressure of 100,000 lb., he would have found that as, regards simple tensile stress, sixteen ½-in. capscrews would be sufficient. Due to

Holding Power of Cup-Point Setscrews on Various Shaft Diameters

Diameter of Setscrew, In.								
¼	5/16	3/8	7/16	½	5/8	¾	⅞	1
Shaft Diameter and Holding Power								
⅞—775	1¼—1710	1½—2090	1¾—2740	2 —3610	2½—4600	3 —6330	4 —7800	4½—8900
1 —850	1½—1920	1¾—2290	2 —2975	2¼—3950	2½—4900	3½—7000	4½—8400	5 —9500
1¼—985	1½—2130	.....	.....	2½—4190	3 —5170	4 —7700	5 —9000	6 —10750
1½—1030	.....	.....	.....	2¾—4430	.....	.....	.....	.....

Note: This table also shows the proper relationship between the diameter of the setscrew and the diameter of the shaft.

Holding Power of Cup-Point Setscrews on Flat Surfaces

(with tightening force as per first table)

Diameter of Setscrew, In.....	¼	5/16	3/8	7/16	½	5/8	¾	⅞	1
Holding Power, Lb.....	1,150	2,240	3,000	3,750	6,150	8,950	12,500	14,000	16,300

Recommended Tightening Force for Setscrews, In.-Lb.

Diameter Setscrew, In.....	¼	5/16	3/8	7/16	½	5/8	¾	⅞	1
Tightening Force, Lb.....	65	150	200	300	500	800	1,500	2,000	3,000

Note: This is approximately 50% of the average torsional strength of the wrench. In special instances a tightening force considerably in excess of twice the above values may be applied.

Recommended Tightening Force for Capscrews, In.-Lb.

Diameter of Cap Screw.....	¼	5/16	3/8	7/16	½	5/8	¾	⅞
In.-Lb.....	200	300	800	800	1,500	2,000	3,000	3,000

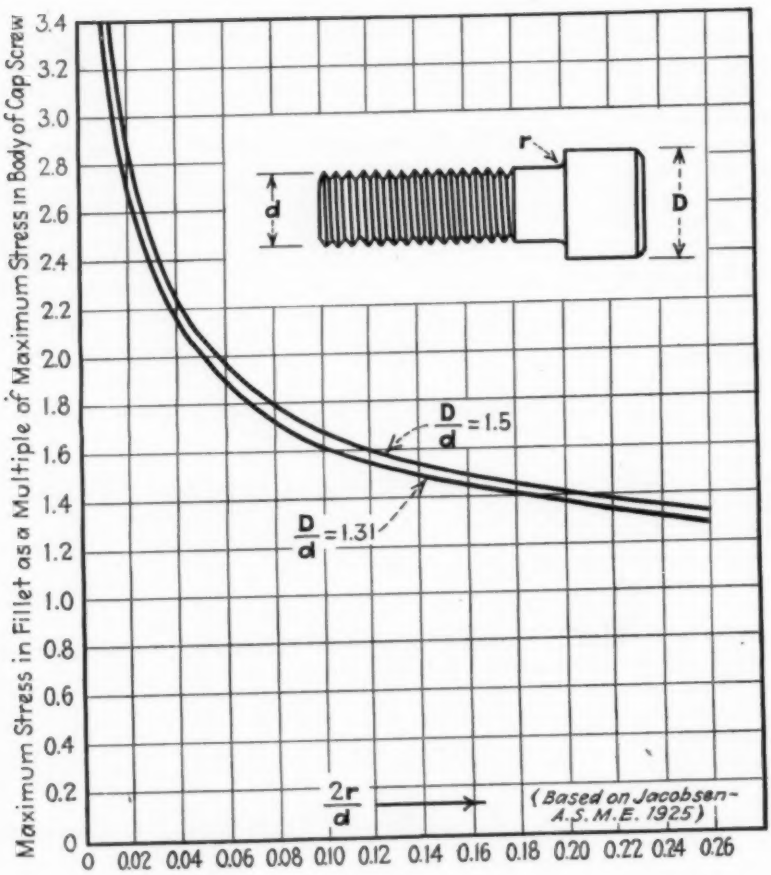
Factors for Stress Concentration in Capscrews

Diameter.....	No. 10	¼	5/16	3/8	7/16	½	5/8	¾	⅞	1
D.....	.3125	0.375	0.4375	0.5625	0.625	0.75	0.875	1.0	1.125	1.3125
d.....	.190	0.25	0.3125	0.375	0.4375	0.5	0.625	0.750	0.875	1.0
$D \div d$.....	.....	1.50	1.40	1.50	1.43	1.50	1.40	1.33	1.30	1.30
Where $r =$ 1/16 $r \div \frac{1}{2}d \div \frac{2r}{d}$.....	.....	0.25	0.20	0.166	0.143	0.125	0.10	0.0833	0.0714	0.062
Where $r =$ 1/8 $r \div \frac{1}{2}d = \frac{2r}{d}$.....	.....	0.50	0.40	0.333	0.286	0.250	0.20	0.166	0.142	0.125

Note: d = diameter of screw; D = diameter of head; r = radius of fillet under head.

Data on Setscrews and Capscrews

(Continued)



stress concentration he would increase the number of capscrews in the die in the ratio of 50 to 78.

The chart is based upon the investigations of Lydik S. Jacobsen relative to torsional stress concentration in circular shafts. The values contained therein agree closely with the investigation of Timoshenko and Dietz upon tensile, and also bending, stress concentration in shafts.

Area at Minor Diameter of Thread

National Coarse			National Fine		
Diameter	Minor Diameter	Area (sq. in.)	Diameter	Minor Diameter	Area (sq. in.)
10–24	0.1389″	0.0151	10–32	0.1517″	0.0180
¼–20	0.1887	0.0279	¼–28	0.2062	0.0333
5/16–18	0.2443	0.0468	5/16–24	0.2614	0.0536
⅜–16	0.2983	0.0698	⅜–24	0.3239	0.0824
7/16–14	0.3499	0.0961	7/16–20	0.3762	0.1111
½–13	0.4056	0.1292	½–20	0.4387	0.1511
9/16–11	0.5135	0.2071	9/16–18	0.5568	0.2435
⅝–11	0.6273	0.3090	⅝–16	0.6733	0.3560
¾–10	0.7387	0.4285	¾–14	0.7874	0.4868
⅞–9	0.8466	0.5629	⅞–14	0.9124	0.6537
1–8			1–14		

THE ROUND TABLE

Averaged Dividends?

"Thanks for the dividend check, Al; I thought they had been done away with."

"The amateur financiers at the seat of government have some such idea, but I don't believe they can criticize the methods we use. I think other manufacturers could copy them with profit."

"You have some queer ideas, Al, but when they result in a check like this, I'm for them. What particular method have you in mind?"

"Well, in the first place we assume we are going to remain in business. We don't stop buying in October to cut down on our inventory, and then buy the market out in January. As a matter of fact we do not take inventory, but that is another story. We simply close our books on the last working day of the year and open them on the first working day of the new year."

"Like everyone else does, what?"

"Exactly, but with a difference. We don't try to make a showing on one day of the year. We ignore the calendar separation of the years and merely balance our books on December 31 because it is customary and is as good a time as any."

"I don't notice any radical improvement in methods, yet."

"Well, you will, if you wait a minute. What we do, or will do, when we have been in business five years, is to take the average of five years for our yearly statement. We can't do that for tax purposes, but we can for our stockholders and for showing our earnings and our resources."

"I see, this dividend check is for five years then. I thought it was generous. I don't think I like that, Al."

"Neither would I, if it were so. You'll get your dividend every quarter, but it will be based on the average earnings of five years. At the end of each year, we will add the earnings of the current year to the total earnings for the preceding four years, divide by five and use half for dividends and the other half for surplus or amortization."

"As I see it, that means that there won't be any melons to cut. I was kind of figuring on that."

"No, there won't be any melons, and there won't be any passed dividends either; you can figure on your check being about what it is now. There'll be no feast or famine. If other companies kept their books like that, buying stock wouldn't be such a gamble because the shares wouldn't fluctuate the way they do at present."

"Nobody'd buy them then."

"Not for speculation maybe, but more people would buy them for investment."

"What do your men have to say about your methods; you pay them a yearly bonus, don't you?"

"Yes. It does the same thing for them. I suppose they'll kick when they know our earnings have been good, but they get just as much in the long run. We may have a bad year some time, but it will take about three bad years in succession to lower our dividend and bonus rates to any great extent."

"That part of it sounds O.K. I suppose being sure of a dividend every year is better than wondering whether you are going to get a fat one or none at all."

"You bet. When we have averaged our dividends long enough to find a fairly stable percentage, we will use it regularly for our dividend rate. We believe that almost every function of management can be made constant or so nearly so that adjustment is necessary only once in several years."

Is averaging the earnings of several years better or worse than running a business on a single-year basis? What is a fair division of profit between surplus and dividends?

Discussion

Moving Again

Whether or not it is the better policy for Al to buy more space or build a new factory depends upon many circumstances. Business develops under such uncertain conditions that it is better to be careful about building. If a survey of the market is favorable, building a new factory may be the right thing to do.

If I had to make the decision, I think I would buy more space and watch if sales increased enough to warrant building. In the meantime, if Al were unable to get the production required, he could get some other shops to help him out. If Al had no other choice than building to get more space, he would probably choose a country location, that is if he were merged with the NRA movement, or if he cared for his men. They would appreciate a manager who had personal interest, not only in the dollars they helped create, but also in their welfare and that of their families.

If Al has a real desire to be a foreman again, I do not think he is the right kind of manager. For the real leader worries and troubles are to be mastered; they should never serve as an excuse for not knowing what to do.

—A. E. FRISTEDT,
Stockholm, Sweden

Moving would surely depend upon the nature of the shop product. Is it a seasonable article that would make it necessary to lay off men at times, or is the demand sufficient to keep the plant on full time the year around?

The policy of the management should be made clear as to the amount of profit per year expected. This alone will decide whether to expand the present plant or to move to a larger building. In the small plant where the business is at present, the conditions such as plant, labor, staff, supply of raw materials, transportation and vicinity to customer's areas are already organized in such a way as to allow a profit to be made. If the profit is not large enough, can the conditions mentioned be reorganized or improved within the present area?

If a new building is to be built on undeveloped land, then there will be considerable outlay besides that for building the shop itself. Power, streets, houses, water and places of amusement do not materialize in a night.

—W. A. Harris,
Coventry, England

Unions or NRA?

NRA and the Labor Board have not permanently taken over the functions of labor unions. In pugilistic terms they are "softening up" hard-boiled management in general by present-emergency legal methods for easier handling by future labor-union leaders. In the past, the majority of employers have been able to fight strikes or disagreements to a finish, even if they were financial losers. Except in isolated instances, industry is now tamely submitting to NRA and the Labor Board decisions.

Labor unions do not need to broaden the scope of their activities to hold their members. Their leaders are too crafty and too shrewd politicians to pick up a general load during this period while wages, working hours and working conditions are being skilfully handled by others. Without doubt they will do a lot of "shadow boxing" to keep their members interested, but they will hardly undertake any broad-scale new activities.

—E. E. Gagnon,
Mechanical Superintendent,
Raybestos-Manhattan, Inc.

While the present codes are steps in the right direction, only the greediest men would agree that the minimum wages and the maximum hours are anywhere near where they should be to insure workers a decent living.

Workers have been doing a lot of thinking during the past few years, and it is up to them to see that the benefits gained under the temporary codes are made permanent. It is not fair to picture all unions as radicals eager to bankrupt their employers. Unions can and do call attention of management to many conditions that can be changed at small cost and to the mutual benefit of employers and employed.

As for entering politics, I believe that labor will confine itself to voting for unselfish, honest, intelligent men, regardless of party affiliations. If every American would do likewise, it would indeed be a new deal for a new day.

The National Labor Board has its place as an arbitrator, but it will never lessen the necessity for unions because only a local organization can be aware of purely local conditions.

—C. A. Johnson.

There is little doubt that the labor unions will continue to exist, in spite of the great amount of their work having been taken over by NRA and the Labor Board. However, in the future, labor unions will bear little resemblance to the unions of today. It is true that they will continue to fight for higher wages, and that the fight for shorter hours will go on, but there will be little of the kind of fight, spirit and enthusiasm that caused hundreds of strikes yearly.

The labor unions will be the discus-

sion groups of the workers, and their educational center. In other words, they will attempt in the future to play fully as an important rôle in the national affairs as do the employers and their organizations. They will begin to fight for representation in all the governing bodies in the land. In the future, a great deal of the communistic and the socialistic votes and power will be transferred to them, and they will serve as one great political party for all workers.

—Fred Bennett,
Superintendent,
Standard Products Company.

That labor unions are now losing ground and will soon cease to be of value is a mistaken notion. It is true that NRA and the Labor Board are now doing the work formerly done by the unions. It is true that NRA has given the workers many of the advantages for which they fought for many years, such as shorter hours and higher wages.

The labor unions must now act as watch dogs to see that the advantages gained are kept. Should the unions dissolve, slowly but surely the same conditions would begin to arise—and how would workers appeal? Would a single voice be of any value? No, the unions will continue to exist, and without adding any new activities or changing the general scope of their work. The workers realize that the unions are their protection, even though there appears to be but little use for them at present.

—Morry Tanenbaum.

Uniform Accounting

Any plan that has standardization of procedure for its object should be acceptable to any branch of industry. The relative values to be derived from uniform accounting can not be overemphasized. Having Al obtain from the metal-working shops an expression of their peculiar requirements will not result in a method that will meet with complete approval, for it is practically possible to take care of variations.

A better plan would be to have an expert accountant formulate an ideal method of accounting and present it to the several managements of the industry for approval. It is rather silly to entertain the idea that uniform accounting will prevent unlimited price cutting. Many of those who think so do not know what their costs really are. It may be presumed that a small concern with limited output would have costs slightly less than those of a large plant having an overhead in proportion. But this is not always the case; otherwise, there would not be any large plants; they would naturally fade out of the picture.

—Harold L. Wynn,
Executive Engineer,
Pacific Electric Mfg. Corporation.

The Buyer

In the large plant the duties of the purchasing agent should end when orders are placed and satisfactory material is in store. Although this sounds simple until it is considered that the purchasing agent must be qualified to digest properly prices, quality, statistics and technical information relative to the commodities needed, and that this procedure must coordinate with other phases of the administration.

Conditions in the small plant, however, are obviously different, because administration methods are not so complicated, and it is logical to place the storeroom under the direct supervision of the buyer. He will then be in closer contact with the stock and can aid in preventing the accumulation of dead stores, thus reducing inventory costs. He will also be in position to note whether or not the purchased material is uniform in quality.

—Peter L. Budwitz.

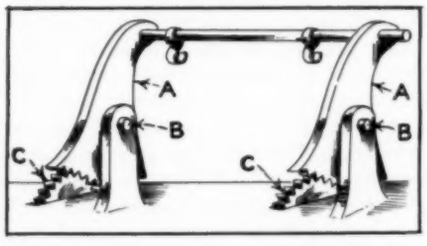
• IDEAS •
FROM PRACTICAL MEN

Machine for Handling Diesel Crankshafts

JOHN TALBOT

One builder of Diesel engines still scrapes the crankshaft bearings because his tests have convinced him that this method gives more satisfactory results. Since some of his crankshafts are 20 ft. long, or longer, and have from seven to nine bearing spots, the job is necessarily a lengthy one and requires the services of either an overhead crane or a pair of jib cranes for handling the crankshafts in and out of the bearings as the scraping progresses.

To avoid wasting the time of the crane, this engine builder has built the crankshaft-handling machine illustrated herewith. The driving part of the machine is below the floor, so that nothing but the parts shown in the illustration can be seen. The arms *A* are pivoted at *B* and have gear segments on their lower ends, meshing with pinions *C*. The pinions are keyed to the driving



This machine is powerful enough to handle the largest Diesel crankshaft in and out of the bearings as they are being scraped

shaft, which is operated by a reversing motor equipped with a solenoid brake. By this means, the arms can be brought to any position between the vertical and the horizontal and can be held in any position by the brake. At the upper ends, the arms carry a bar on which are S-hooks for holding the crankshaft.

In use, the crankcase is set in correct position in relation to the handling machine by the overhead crane, which also places the crankshaft in the bearings. Thereafter, the crankshaft is raised or lowered by the handling machine, the S-hooks being placed over the ends as required. The machine has the advantage that no jockeying is needed in placing or removing the shaft, and there is no danger of its being injured by striking the edges of the bearings as it is raised or lowered. Furthermore, the two men doing the scraping can handle the whole job easily and without loss of time in waiting for the crane.

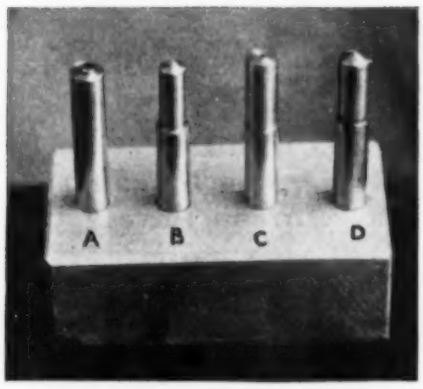
Diamonds Set Without Brazing

HECTOR J. CHAMBERLAND

While diamonds for dressing abrasive wheels are usually set by brazing, it is not always the best method because expensive stones are frequently injured by being overheated. By the method to be described, a diamond can be set by any toolmaker in less than an hour and at a cost no greater than it could be set by brazing by an expert setter. The method is nothing but a soldering job and a little machining. While the stone will loosen if the solder is heated to 620 deg. F., it will not come out of the setting.

A hole is drilled in one end of the holder, slightly larger than the diamond and deep enough to permit the diamond to project about two-thirds of its length. The end of the holder is then faced so as to leave a nipple having a $\frac{1}{32}$-in. wall and projecting about $\frac{1}{32}$ in., as shown at *A* in the illustration. A small quantity of so-called liquid solder is dropped in the hole and the diamond is inserted. After waiting for one or two minutes for the liquid solder to stiffen, the diamond point can be adjusted in line with the axis of the holder. This can best be done while revolving the holder in the lathe.

The top of the setting is then covered with ordinary lead solder and is faced to an angle a few degrees steeper than the ordinary drill point. The holder is also turned down for about an inch from the end, as at *B*. A sleeve having a closed end is made by drilling and reaming a piece of drill rod to within $\frac{1}{16}$ in. from the end. A hole from $\frac{1}{32}$ to $\frac{1}{16}$ in., according to the size of the diamond, is drilled in the closed end. When



An industrial diamond set in solder and protected by a sleeve can not be torn from the holder by careless use

pressed on the holder, the sleeve will contact with the diamond at the intersection of the hole. The holder with the sleeve pressed on may be seen at *C*. It is now necessary only to face the sleeve to an angle of about 70 deg. from the side, as at *D*, continuing the facing until the point of the diamond projects.

The turned down portion of the holder should be about 0.001 in. larger in diameter than that of the inside of the sleeve, so as to make a tight press fit. The diamond can not come out of the holder and be lost, no matter how carelessly it is used.

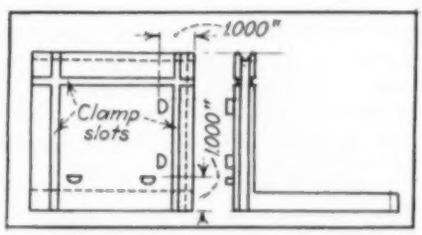
A Convenient Angle Plate

GEORGE BELBES

The angle plate illustrated was recently brought to my attention. It embodies some highly desirable and time-saving features and should find wider adoption in both tool and inspection departments.

A great variety of work can be mounted on such an angle plate, either parallel with or at right angles to the base by locating it against stop pins placed to suit and clamping it in place. Fixing the stop pins at 1.000 in. or any other convenient height will further facilitate measurements.

Another advantageous feature is that



The V-grooves and the locating pins give very desirable and time-saving features to this angle plate

V-grooves are cut in the top and in the sides, so that the device can easily be converted into horizontal and vertical V-blocks.

Loops for Handling Driving Boxes

DAVID WILLIAMS

In handling locomotive driving boxes by the usual cluster of grab hooks, there is always more or less danger of the hooks slipping and letting the boxes fall. Carrying driving boxes held by grab

Driving boxes can be safely handled by these iron loops that hold them by both flanges for the full length

hooks on a crane over the heads of workmen is especially dangerous.

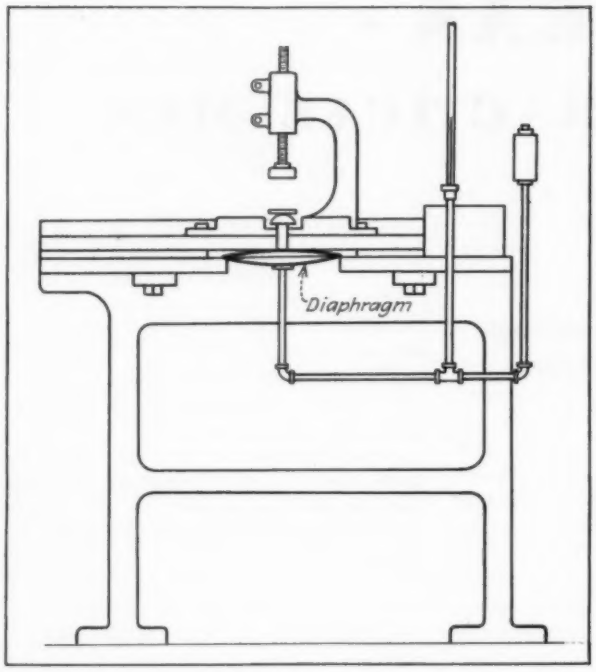
If, instead of grab hooks, loops made from rods, as shown in the illustration, are used, it is impossible for the driving boxes to slip out of them because they engage the full length of both flanges.

A Homemade Liquid Gage

ROGER B. WILLIAMS

Small parts are often inspected by sampling; that is, about ten per cent of the parts are inspected, and if found within the required limits, the whole lot is passed without further inspection. It frequently happens, however, that 100 per cent inspection is required on some one or more dimensions. For this purpose a simple, rapid gage can be made up in any shop from a glass tube, a couple of disks and a piece of small brass or copper tube, as shown in the illustration.

Accuracy is not required at any place, but it is desirable to make the diaphragm with approximately an area of 1,000 to 1 of the hole in the glass tube. For instance, if we use a tube having ¼ inside diameter, the two disks for



Tolerance limits are readily seen on this simple hydraulic device employed for 100 per cent inspection of small parts

the diaphragm would have to be about 4¾ in. diameter.

Dish the edges of the two disks slightly by peening, so that when placed face to face they will be separated slightly. To the center of one disk weld or solder a ⅛ in. brass coupling. To the center of the other disk attach a piece of brass or steel about ⅜ in. diameter and 1 in. long, in a vertical position. Then weld, sweat or solder the edges of the two disks together and test for leaks.

Into the coupling on the lower disk screw a piece of ⅛ in. brass pipe. Place a tee where it is desired to locate the gage glass and extend the ⅛ in. pipe to a convenient place and height for filling the diaphragm with water in which has been placed a little coloring matter of some kind: ink, permanganate, or water color. Fasten the diaphragm to a board, so that the edges rest firmly. The best way to do this is to cut a round hole in the board about ½ in. less in diameter than the diaphragm and use tacks around the edges of the diaphragm so that it cannot move sideways.

The shape of the frame and anvil used for the actual gaging is optional, but we found it convenient and economical, on mass inspection to have a light casting made. The boss at the top of this casting is either threaded with a ⅜-20 tap, or sawed and clamped. We tried both and finally settled on the clamp method. Through the platen, in line with the hole in the boss, a ⅜-in. hole was drilled and reamed, and a button-head pin fitted to it. The upper part of the ⅜-in. hole was counterbored for a helical spring that supported the weight of the pin. The bench on either side of the platen was brought to the same height by fastening boards on the bench top. The pin was filed to length so that its movement, when flush with the platen, was not more than 0.01 in., corresponding to the rise of liquid in the gage glass.

Finally, to provide smoothness of movement, a strip of spring steel about 24 in. long by 1½ in. wide was fastened, by one end only, to the bench so that it laid, loosely, across the button-head pin.

The method of setting up is to measure one of the parts, place it under the gage, and note where the liquid comes in the tube and place simple markers at the maximum and minimum positions. A rubber band, a sticker of any kind, a bull-dog spring clip such as timekeepers use on their record board are all good, as they can be shifted up and down as occasion demands. The end of the upper pin or gage point should have a head of such shape that the pieces to be gaged will not catch.

With an arrangement of this kind it is possible at times to press the diaphragm pin and squirt the fluid out the top of the open-end glass tube. To guard against this we fitted an ordinary water glass loosely over the gage glass and put a cork in the upper end of the outer glass.

The description of this gage sounds complicated, but it is simple to make. Rubber tube can be used instead of ⅛ in. brass pipe if it is heavy enough to resist expansion by the water. The gage glass can be located where required and the rising liquid can be made to light a lamp or initiate other functions.

NEW BOOKS

★ ★ ★

THE BOOK OF STAINLESS STEELS. *Edited by Ernest E. Thum, editor of Metal Progress. 614, 6x9-in. pages. 200 illustrations. Bound in cloth. Published by the American Society for Metals (formerly American Society for Steel Treating), 7016 Euclid Ave., Cleveland, Ohio. Price $5.00.*

Most of the development and application of the so-called "stainless steels" has taken place since the World War. Paralleling this activity there has been a flood of technical literature on various phases of the technology of these high-chromium heat- and corrosion-resisting materials. But until the present there has been no book on them to afford a comprehensive picture of American practice and usage. In view of this situation, and for his careful selection of and editing of the material, the editor it to be heartily congratulated for having performed a real service to fabricators and consumers of stainless.

Chapters by 77 authorities make up this book. Several chapters of Part I are devoted to manufacture of stainless castings, plate and tubing. Others deal with finishing and fabricating operations such as machining, press work, grinding, heat-treatment, welding, and plating for wear resistance. Properties of typical alloys are discussed in Part II. Part III deals with the requirements of the consuming industries, covering such fields as chemicals and foods, power, transportation, metallurgical and architectural. A complete and useful index of trade names follows. Many fine photographs are used throughout the text.

★

COST AND PRODUCTION HANDBOOK. *Edited by L. P. Alford. 1,600 pages, 4½x7¼ inches. Published by The Ronald Press Company, New York. Price $7.50.*

This is believed to be the first comprehensive book on that vital subject, costs. It is impossible to obtain an adequate idea of its contents without considerable study of the book itself. Its 28 sections include Production and Expense Budgets, Factory Organization, Production Planning and Control, Simplification and Standardization, Purchasing, Rate Setting, Buildings and Fixed Equipment, Machinery, Small Tools, Cost Accounting, Cost Analysis, Depreciation and Obsolescence, Estimating Product Cost and Labor. The other sections are perhaps equally important.

Among the 80 men who contributed to this volume, each in his specialized field, are Prof. O. W. Boston, James B. Doan, Ralph E. Flanders, Dean Dexter S. Kimball, Edward A. Muller and Prof. Joseph W. Roe. There are 700 tables, charts and forms used by prominent concerns in handling their various activities, which gives some idea of the scope of the book and the labor involved in its preparation. It should prove of great value to any executive who is responsible for costs.

★

VALUABLE HINTS TO INVENTORS. *By A. F. Gillet, vice-president, Jubilee Mfg. Company. 94, 5x7½ in. pages, Cloth. Published by the Inventors Publishing Company, Washington, D. C. Price, $1.00.*

Seven independent essays, of non-technical style, are bound together. The subjects treated are the outgrowth of experience and practical development in the field of invention and deal with the common inventor's problems and what he should know. Perhaps the most practical chapters are on the subjects of: what to invent, when to apply for a patent, and how to proceed to make a patented invention pay.

★

THE ECONOMICS OF THE RECOVERY PROGRAM. *By Douglass V. Brown, Edward Chamberlin, Seymour E. Harris, Wassily W. Leontief, Edward S. Mason, Joseph A. Schumpeter and Overton H. Taylor, of Harvard University. 188 pages, 5x7½ inches, bound in cloth boards. Published by Whittlesey House, McGraw-Hill Publishing Company, Inc., New York. Price $1.50.*

Seven essays on various phases of the New Deal make up this volume. On economic grounds the gentlemen from Harvard are against most of the attempts by the Administration to accelerate recovery. One of them admits, however, that political considerations may have some force in a democracy, and that therefore it may not be altogether conclusive to judge the attempts solely from the economist's point of view.

The subjects of the seven essays are: Depressions, Purchasing Power, Controlling Industry, Helping Labor, Higher Prices, Helping the Farmer, and Economics versus Politics. Just why an economist finds it so difficult to express himself simply and directly is still a mystery to the reviewer. The use of interminably long sentences (one, at least, contains 110 words) is one reason why this book is so hard to read.

PROCEDURE HANDBOOK OF ARC WELDING, DESIGN AND PRACTICE. *434 pages, 5¾x9 inches. Heavily illustrated. Flexible binding. Published by Lincoln Electric Company, Cleveland, Ohio. Price $1.50.*

Its compilers have included in this volume practical information for the designer and for the welder and welding department executive. A brief chapter on the various types of welding and the equipment required for each acts as an introduction to the rest of the book which is confined to arc welding. Part II is devoted to the technique of arc welding, Part III to procedures, speeds and costs for welding mild steel, Part IV to the structures and properties of weld metal, Part V to the weldability of various metals, Part VI to designing for arc-welded construction of machinery, Part VII to designing for arc-welded structures, and Part VIII to typical applications. The numerous examples make the book practically useful to anyone having anything to do with welded design or construction.

★

THE ENGINEER'S MANUAL OF ENGLISH—*By W. O. Sypherd, professor of English, University of Delaware, and Sharon Brown, associate professor of English, Brown University. 51 pages, 4½x6⅝ in. Indexed. Imitation leather binding. Published by Scott, Foresman and Company, 623 S. Wabash Ave., Chicago, Ill. Price $2.00.*

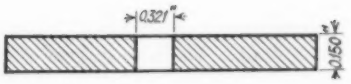
Analytical but inarticulate, is the popular appraisal of the average engineer. Whatever may be the justice of this conception, the manual by Professors Sypherd and Brown should do much to dispel it.

Conveniently printed in a pocket-sized edition, the volume permits of no excuse for an engineer to be caught without the means for converting his ideas into intelligible expression. Its contents are divided into two parts, the first giving the principles of many types of engineering writing and the second devoted to specific specimens of these types taken from technical books and publications. Preparation of manuscript and other useful suggestions are given in a series of appendices.

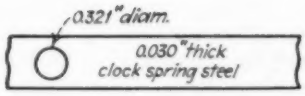
Starting with a chapter on general problems, which gives the broad rules that apply to all writing, and a chapter on style, the manual takes up the particular divisions of English that the engineer will use most frequently. Correspondence, report writing, technical journalism, bulletins and specifications are included. The presentation is terse and to the point as befits an engineering manual.

Press Work Pressures

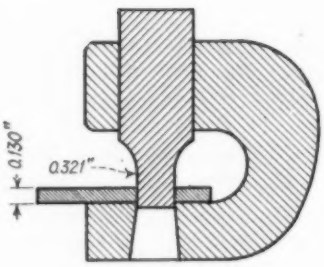
Series XXVI—*Punching*



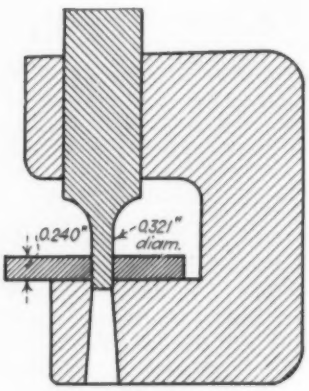
Material--Chrome vanadium steel, annealed,
0.150 in. thick
Operation--Punch a hole 0.321 in. in diameter
Pressure--10,000 lb.



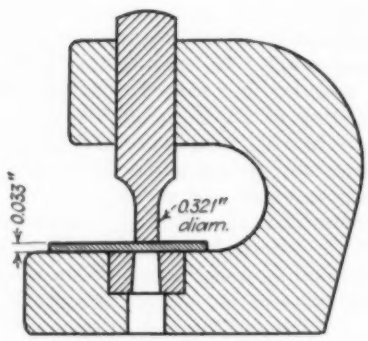
Material--Clock spring steel, 0.030 in. thick
Operation--Punch a hole 0.321 in. in diameter,
1 in. in circumference
Pressure--4,900 lb. - 82 tons per sq. in. for
shearing or punching



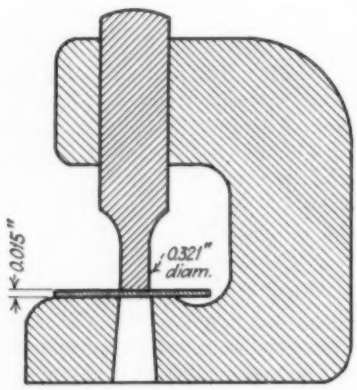
Material--Manganese steel, 0.130 in. thick
Operation--Punch a hole 0.321 in. in diameter
Pressure--16,500 lb. - 68 tons per sq. in. for
cutting or punching



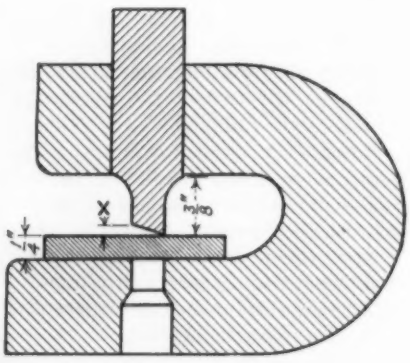
Material--Spring steel, water annealed,
0.240 in. thick
Operation--Punch a hole 0.321 in. in diameter
Pressure--24,600 lb. - 51.2 tons per sq. in.
to shear or punch



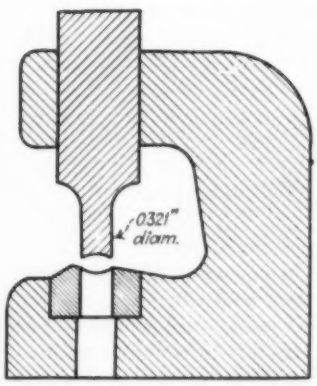
Material--Nickel silver, 0.033 in. thick
Soft steel, 0.031 in. thick
Operation--Punch a hole 0.321 in. in diameter
Pressure--Nickel silver - 1,550 lb.
Soft steel - 1,550 lb.



Material--Armature steel, extra hard, 0.015
in. thick
Operation--Punch a hole 0.321 in. in diameter
Pressure--1,150 lb.



Material--Machine steel, 1/4 in. thick
Operation--Showing various pressures with and
without shear to the punch. Punch a hole
0.321 in. in diameter
Pressure - x - 0 or flat - 12,500 lb.
x - 1/16 in. shear - 12,400 lb.
x - 1/8 in. shear - 11,700 lb.

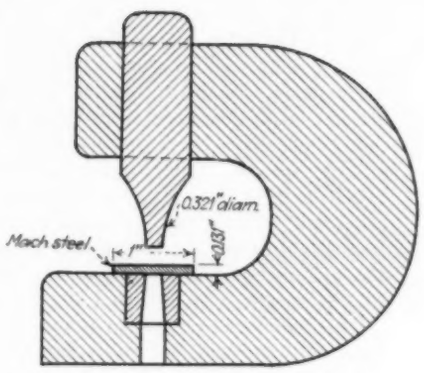


Material--Various metals, 1/16 in. thick, annealed
Operation--Punch a hole 0.321 in. in diameter,
1 in. in circumference
Pressure--Aluminum 600 lb. - 4.8 tons per sq. in.
Copper 1,450 lb. - 11.6 tons per sq. in.
Brass 2,500 lb. - 20 tons per sq. in.
Steel 2,800 lb. - 22.4 tons per sq. in.

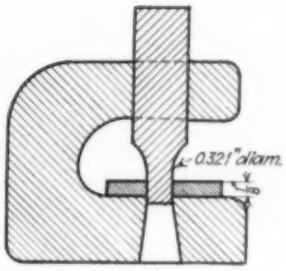
Contributed by C. W. LUCAS © *American Machinist*

Press Work Pressures

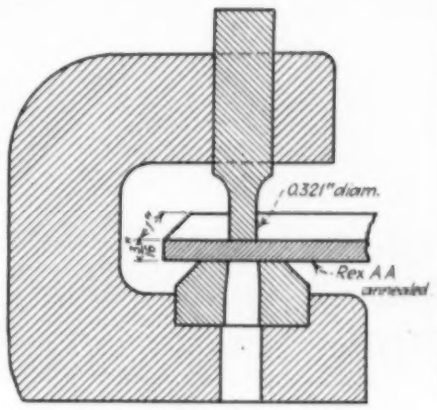
Series XXVI—*Punching*



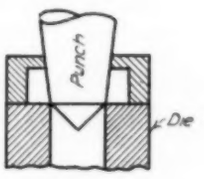
Material--Soft machine steel bar, 0.131 in. thick
Operation--Punch a hole 0.321 in. in diameter, 1 in. in circumference
Pressure--7,900 lb.



Material--Well annealed Rex A A steel, 1/8 in. thick
Operation--Punch a hole 0.321 in. in diameter, 1 in. in circumference
Pressure--10,500 lb.

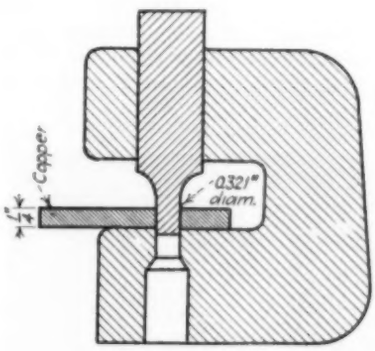


Material--Rex A A high-speed steel, annealed, 3/16 in. thick by 1 in. wide
Operation--Punch a 0.321 in. hole Done cold, die without shear
Pressure--18,300 lb.

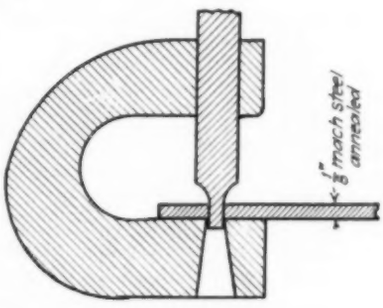


Material--Brake lining, 3/8 in. thick
Operation--Punch a hole 0.321 in. in diameter, 1 in. in circumference Coin sides 7 deg.
Pressure--11,500 lb.

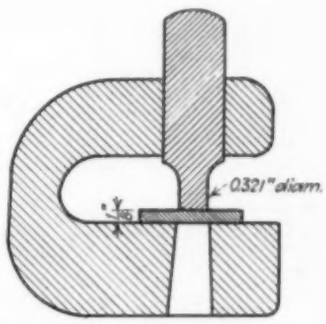
Material--Brake lining 3/8 in. thick
Operation--A-Punch 0.321 in. hole B-Punch 0.642 in. hole
Pressure--A-11,000 lb. B-22,000 lb.



Material--Copper, 1/4 in. thick
Operation--Punch a hole 1 in. in circumference
Pressure--5,900 lb.



Material--Machine steel, 1/8 in. thick, annealed
Operation--Punch a hole 1 in. in circumference
Pressure--8,400 lb.



Material--German silver, annealed, 1/8 in. thick
Operation--Punch a hole 1 in. in circumference
Pressure--6,400 lb.

Shearing Pressure of Various Materials

SAE 1035 - shearing pressure per sq. in - 35 tons
Silicon steel armature disks, shearing pressure - 42 tons
17 ST soft duralumin, 8 ton/sq. in.
17 ST hard " 30 " " "
Angle iron - used on bedstead hooks - 35 tons/sq. in.
Allegheny metal, turbine blade, drop forging - done cold - 75 tons/sq. in.
Tests made in testing machine

Contributed by C. W. LUCAS

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SHOP EQUIPMENT NEWS

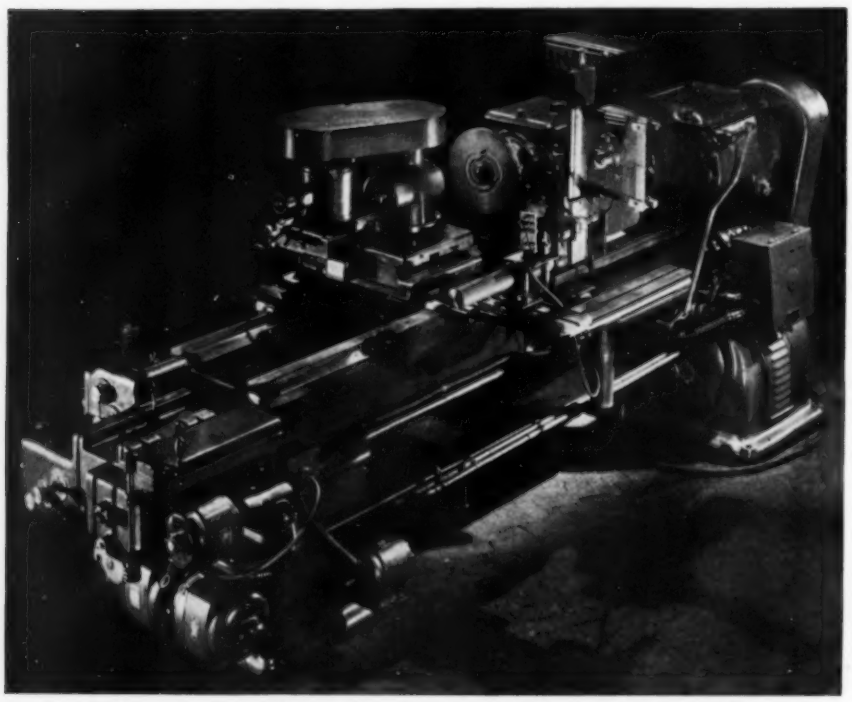
Monarch Cam-Milling Machine Attachment

The milling of face cams, single- or double-track cams, barrel cams and other irregular contour work from a master templet can be undertaken on the Monarch-Keller form turning lathe when it is equipped with a cam milling machine attachment. The attachment consists of a sub-headstock that bolts on the bed of the lathe directly in front of the regular headstock. It is driven by silent chain from a sprocket bolted to the flanged spindle nose of the regular headstock. A complete universal milling fixture fits readily on the carriage of the lathe in place of the regular compound rest.

The attachment can be applied only to the Monarch-Keller form turning lathe built by the Monarch Machine Tool Co., Sidney, Ohio. The milling attachment has a worm-drive spindle giving a 450 to 1 reduction from the spindle speeds provided in the main headstock of the lathe. Chucks, plates and fixtures are readily interchangeable between the flanged spindle nose on the milling headstock and on the flanged spindle nose of the headstock proper. Only a few minutes are required to place the attachment on the lathe and make it ready for production.

The milling machine spindle is mounted on the carriage of the lathe and swivels at any angle. A No. 9 B & S taper is provided to handle the various classes of end mills that may be required. Drive to the milling spindle is from a 1-hp. a.c. motor. This motor is mounted vertically on a movable bracket on the carriage, in order to keep the V-belt drive from the motor to the milling spindle under proper tension. V-belt pulleys having three grooves are provided. They may be readily interchanged between the motor spindle and the milling spindle to give six milling spindle speeds from 200 to 1,700 r.p.m.

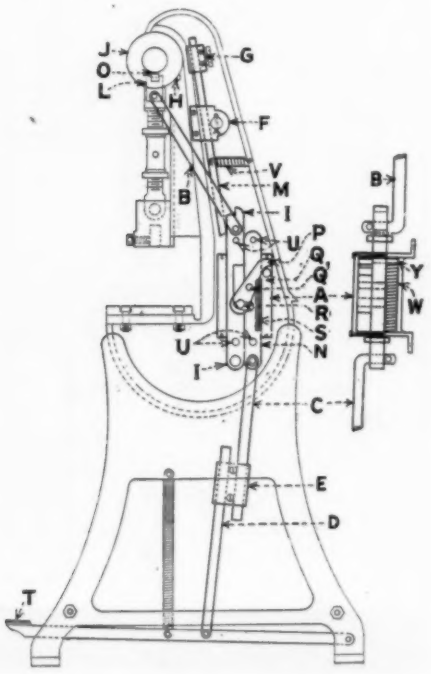
The templets are always made 12 in. long and are laid out in a flat plane. The templet travels its full length to one revolution of the work. When the work has made one complete revolution, a precision contactor switch disconnects the current to the magnetic clutch driving the milling headstock spindle and thereby stops the machine.



Automatic Cam Milling Attachment applied to a 20 in. x 48 in. Monarch-Keller Form Turning Lathe. Face cams 23 in. in diameter and barrel cams 12 in. in diameter may be produced. Swing over the bed of the milling headstock is 28½ in.

"H. & A." Non-Repeating Punch Press Trip

The H. & A. Lock Co., 243-53 Forty-fourth St., Brooklyn, N. Y., is prepared to furnish a non-repeating device for punch presses. Referring to the illustration, by pressing the treadle *T*, the member *N* carrying the actuated member *P* is pulled downward by means of the rods *C* and *D*. Member *P* swings on



stud *Q'* which is fastened on member *N*. The lower end of the member *P* carries a knife-shaped stud that actuates the slide member *I*, while the upper end of member *P* rides around stud *Q* which is attached to the frame block *A*.

By downward motion of the *N*, the slide member *I* is brought down by means of the knife-shaped stud and the motion of member *P*. By means of the connecting rod *B* the clutch *L* is pulled downward, thereby releasing the clutch-key *O*, which causes the flywheel to be engaged.

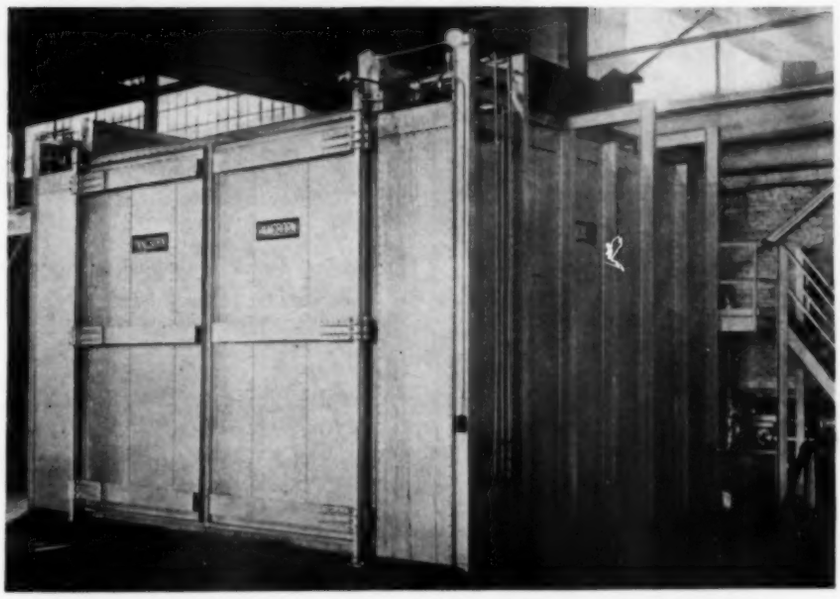
While the slide member *I* is about to be released from the knife-shaped stud, the lower end of the swinging rod *M* is acted upon by spring member *V*, to prevent it from springing upward. This permits the clutch key *O* to engage the flywheel and set the crankshaft of the press in motion.

When the crankshaft *J* is in motion, the slide member *I* is released by means of the lifting cam *H*, acting against block *G*. This releases the clutch cam *L* returning it to its normal position before the clutch key *O* releases the crankshaft from the flywheel. Thus the press cannot repeat its operation until the treadle is relieved from the pressure of the foot and re-tripped. By transferring the connection of the rod *C* from the slide member *N* to the slide member *I*, the press can be operated the same as though no safety appliance had been attached.

Pangborn Casting Washer

The Pangborn Corp., Hagerstown, Md., is now building equipment for washing castings, utilizing water at 300 to 400 lb. per sq.in. An example is the installation of such equipment at the Bucyrus-Erie Co., South Milwaukee. This equipment is designed to clean steel castings ranging in size from small gears to large revolving frames weighing 15 tons. Previously the core sand, core rods and gaggers from the castings were removed by a crew of men using pneumatically operated pokeout bars, a slow and dirty process. A 15-ton casting previously requiring about 35 hours to clean is now finished in from 1½ to 2 hr.

The equipment consists of a steel room 25 ft. square on the inside and having an over-all height from the floor level of 17 ft. 9 in. Two front doors are operated by hydraulic cylinders and provide an opening 15 ft. wide and 16 ft. high for moving castings in and out of the room. An opening in the top permits the use of a traveling crane to place the work on the turntable in the center. The 12-ft. rotating table is fitted with twelve equally spaced T-slots as well as a number of holes for stanchions and chains to hold the work. Turntable capacity is 50 tons and it is rotated in either direction by a 10-hp. waterproof motor. Thus, the stream of water can be caused to strike the work at any angle. Two operating stations are located at one corner of the room, one above the other. Shatterproof windows above the nozzles permit the operator to see the work in the room and to direct his nozzles where required. As water is reused the cost is low.

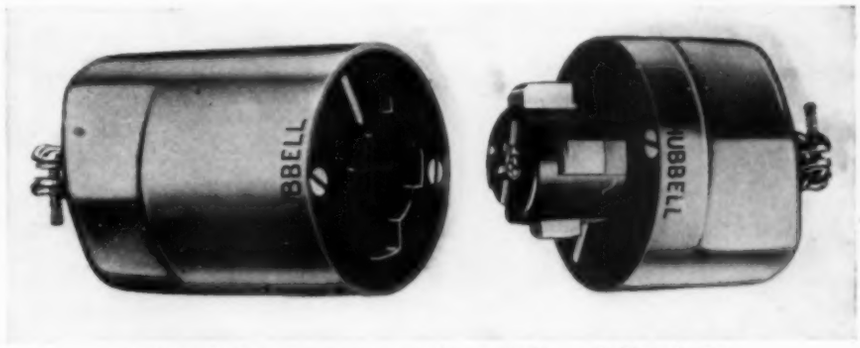


Water at 300 to 400 lb. per sq.in. quickly removes core sand, core rods and gaggers from a wide range of sizes of work in this Pangborn Casting Washing Room

"Hubbellock" Cord Connectors for High-Frequency Portable Tools

Harvey Hubbell, Inc., Bridgeport, Conn., is introducing a line of approved industrial devices designed for high-frequency portable tools. The line consists of 4-wire polarized receptacles and cord connectors and caps. A positive locking feature prevents accidental breaking of the current, and polarization prevents insertion of the cap in any but the proper position. Grounding of the metal casings is positive because the ground blade is longer than the other blades, and thus makes contact first and breaks it last. Receptacles and connector bodies, through the use of a disappearing bakelite plunger, are dead front.

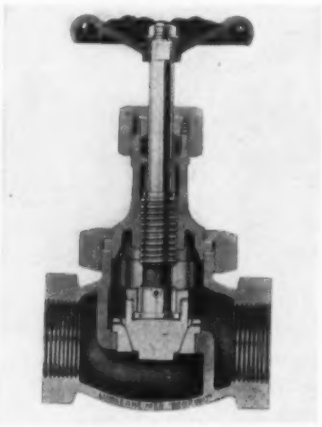
"Hubbellock" No. 20401 Receptacle with cast-iron lift cover plate



"Hubbellock" Connector Body and Cap of the 4-wire polarized type for high-frequency industrial portable tools

Lunkenheimer "Renewo" and "Ferrenewo" Valves

For severe service demanding maximum resistance to destructive action on valve-seats, The Lunkenheimer Co., Cincinnati, Ohio, has developed "Renewo" and "Ferrenewo" valves with plug-type alloy seats and disks. Full length, deep



seated plugs are ground each in its own seat. Excepting bodies and bonnet rings, all parts of "Ferrenewo" and "Renewo" valves are interchangeable. Iron-body, bronze-mounted "Ferrenewo" plug-type valves are made for 150 lb. steam pressure, while the bronze "Renewo" valves are available in 200 and 300 lb. steam-pressure patterns.

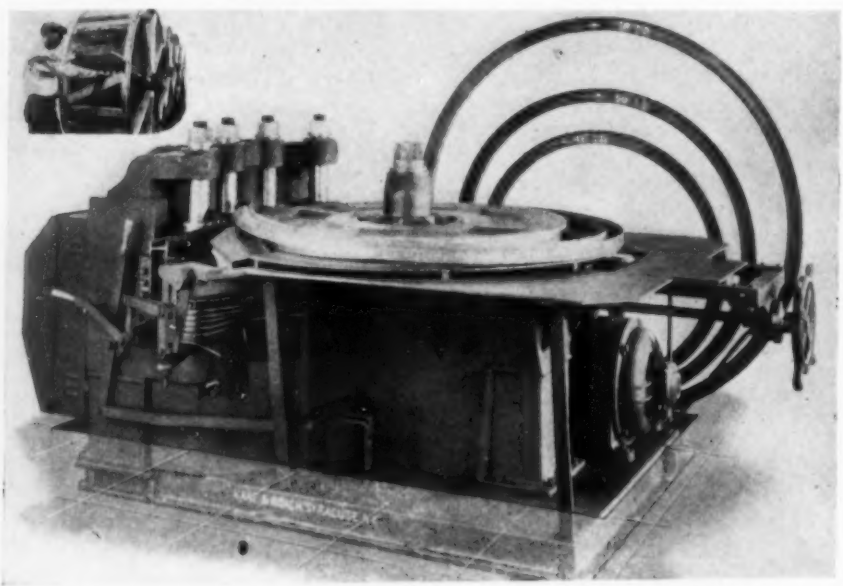
Kane & Roach No. 16-D Horizontal Wrapping-Type Bending Roll

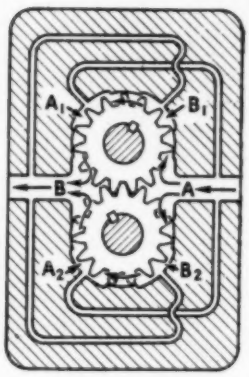
For bending I-beams used as rims for electric cable reels, the Kane & Roach, Inc., Syracuse, N. Y., recently furnished the No. 16-D horizontal wrapping-type bending roll illustrated. The machine bends 3 in. I-beams, 5.7 lb., 6.5 lb., and 7.5 lb. per ft., into rings from 48 to 78 in. internal diameter. The stock is bent to practically a true circle including ends, thus eliminating waste. Power is supplied by a 30 hp., 1,140 r.p.m. constant-speed motor. Production of the machine is approximately 45 lineal ft. per minute. Electrical control with forward-reverse-stop push-button and the friction clutch, operated by hand lever, are located conveniently for the operator.

Vickers Balanced Gear Pump and Fluid Motor

A balanced gear pump and fluid motor has been developed by Vickers, Inc., Detroit, Mich. When used as a motor the unit can be started under full pressure and it has full torque when stalled. Also, the unit may be used as a pump or motor and rotation is reversible without internal changes. It

Vickers Balanced Gear Pump and Fluid Motor, adaptable to either purpose





The operating principle of the Vickers unit assures balanced pressure on each gear

has operated at pressures up to 1,500 lb. per sq.in.

The schematic drawing illustrates the principle of the unit. Adjacent to the gears and diametrically opposite to the inlet chamber A, are balancing chambers A_1 and A_2, which are connected to A, and which open to its pressure. Similarly, balancing chambers B_1 and B_2 are connected to an outlet chamber B and are open to its pressure. Each gear is, therefore, always in hydraulic balance. The result is higher efficiency and greater permissible operating pressures.

"Quickwork" Stamping Trimming Machine

A machine that trims stampings in one plane, such as refrigerator tops, bread pan tops and bottoms, and certain automobile stampings is now manufactured by the Quickwork Co., St. Marys, Ohio. The cutters revolve continuously. One cutter is moved to and from the other by actuating the lever at the operator's right hand. The table top is made large enough to accommodate the largest stamping handled and serves

"Quickwork" Stamping Trimming Machine with form mounted on table to gage the cut from the top of the stamping

as a gage. In the event that it is desired to gage the cut from the top of the stamping, a form such as illustrated on top of the table is provided.

The machine is driven by a geared-head motor, and all bearings are of the anti-friction type. Major parts are of arc-welded plate construction. The metal cutting speed provided for each machine is influenced by the nature of the stampings to be trimmed. For large stampings with small radii at the corners, two speeds are provided. The high speed in this case is three times the low speed.

Gardner-Denver Vertical Air Compressors

The Gardner-Denver Co., Quincy, Ill., is now building a line of vertical air compressors which are said to deliver the same amount of air as horizontals of the same capacity, but which offer lower price, installation cost and maintenance cost. Inlet and discharge valves are cushioned and silent. Large water jackets surround the cylinders and valves to assure minimum cylinder temperatures. A water-cooled intercooler increases volumetric efficiency. Crankshafts are of forged steel supported by three main bearings of bronze-backed, babbitt-lined, full-circle type. Pressure-feed lubrication is applied to all bearings through drilled passages.

Osborn Tramrail Sliding Switch

The Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland, Ohio, is now manufacturing a tramrail sliding switch (patents pending) which is said to have the following features: Minimizes the necessity for superstructure; fewer supporting fittings; eliminates bending and fitting curves to the switch; eliminates angular rail cuts; lowers erection time and headroom loss; positive latching; easier rolling carriage. The switch is built in capacities up to 3 tons. Both Osborn "Teerail" and "Beamrail" with standard jig-drilled ends can be fitted to the switch without further drilling or cutting in the field. This switch permits the spacing of spur tracks as close as 30 in.

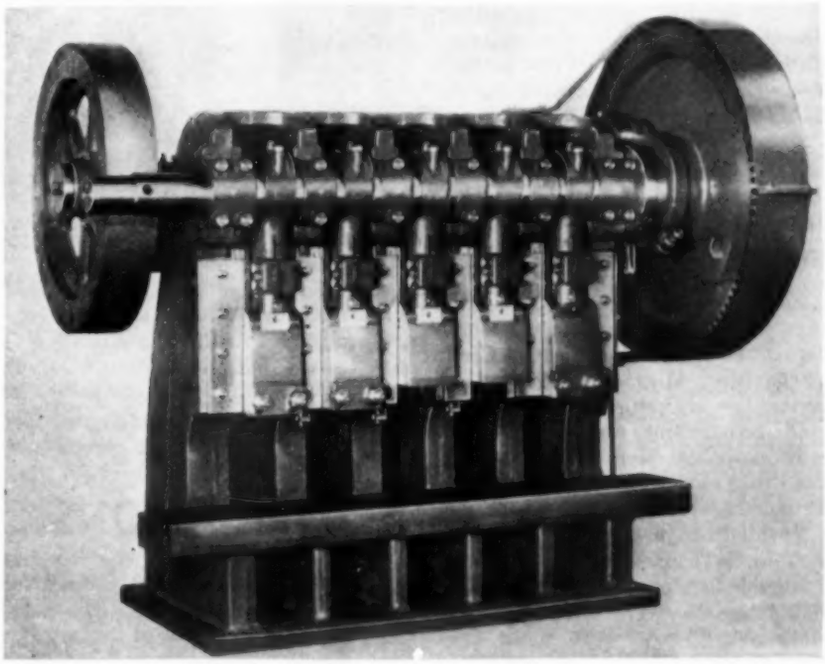
Rockford Five-Slide Press

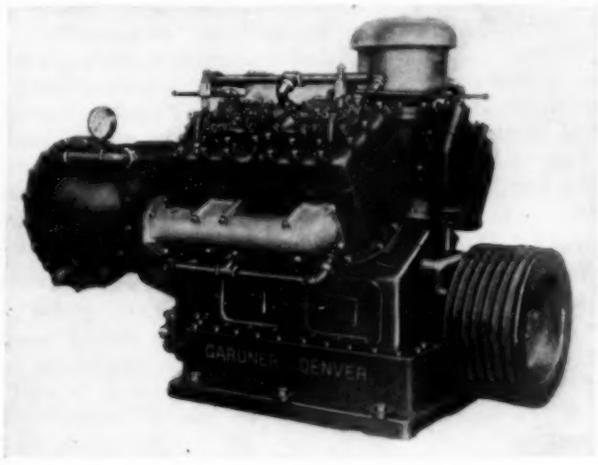
Five independent slides operated from a single crankshaft were employed in a press recently built by the Rockford Iron Works, Rockford, Ill. This type of press may be had in two-, three-, four- or five-slide models of either the flywheel or geared type. Connections, screws, rams, flywheels and clutch are all standard parts of the Nos. 1 and 2 inclinable presses.

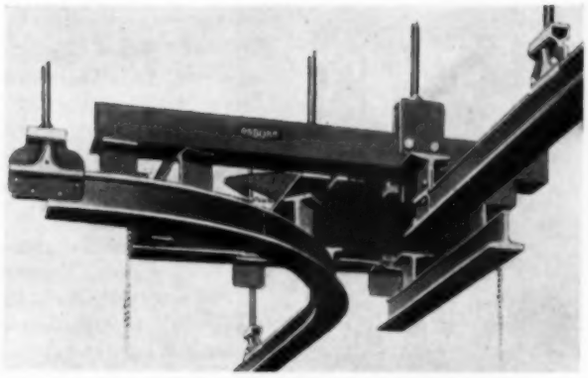
The five slides each have adjustment, and the bearings are bronze bushed. The crankshaft is heat-treated and the frame is a semi-steel casting. Three of the slides are built for the conventional type of punch holder, while the remaining two are shorter for special work. On small parts where handling is a factor, the piece can be moved from one die to another. Considerable set-up time is eliminated by leaving each job set in the machine.

Fleming Power-Driven Grindstone

Certain types of tools are still sharpened on grindstones, particularly in the cutlery trade. The Fleming Electric Tool Division of the Loring Coes Co., Worcester, Mass., is now producing an electrically operated grindstone that can be operated either by power or by hand. On one side the grindstone has a small electric motor connected through an







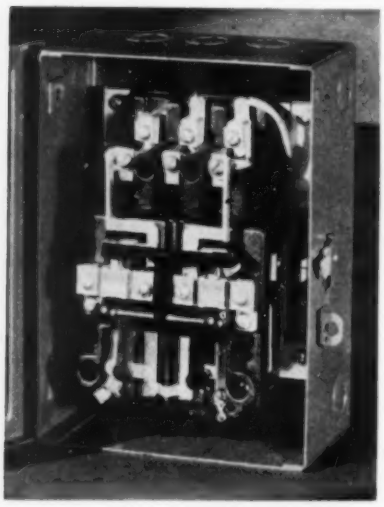
Left—Gardner-Denver Vertical Air Compressor. Above—Osborn Tramrail Sliding Switch built in capacities up to 3 tons

Fleming Motorized Grindstone for sharpening cutlery and tools

overriding clutch to the shaft of the stone, while the shaft extends beyond the framework on the other side and is keyed for a hand crank. The motor drives the wheel at the rate of about 60 r.p.m. The machine is designed to take a 22x2 in. natural sandstone.

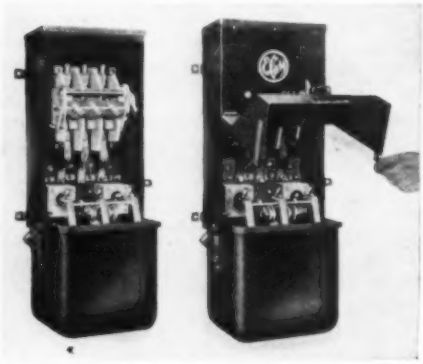
Square D Solenoid-Type Automatic Motor Starter

A solenoid-type, automatic, electric motor starter is being manufactured by the Square D Company, Industrial Controller Division, Milwaukee, Wis. The contactor has a vertical, straight-line solenoid action and cannot be accidentally closed by vibration. Thermal overload relays are mounted on the front of the panel and are easily interchangeable. Pushbuttons on the cover are extra large, 1 in. in diameter. Contacts are silver, double-break, and of high current-rupturing capacity. The starter is designated Class 8552, Type F, and has a maximum polyphase rating of 5 hp., 220 volts; 7½ hp., 440-550 volts. It is also built with a four-pole contactor for two-phase service.



E. C. & M. No. 2 Type ZOS Magnetic Starter

For motors up to 30 hp., 220 volts; 60 hp., 440 volts, and 75 hp., 550 volts, the Electric Controller & Manufacturing Co., 2708 East 79th St., Cleveland, Ohio, is offering a No. 2 Type ZOS oil-immersed, across-the-line, combination magnetic starter. An unfused or a fusible safety switch, a magnetic starter with overload relays and internal wiring are features of the starter. Although



designed for severe service encountered in mill duty, the starter is small and narrow and is thus suitable for mounting in restricted spaces.

• TRADE • PUBLICATIONS

ALUMINUM. The Aluminum Company of America, Pittsburgh, Pa., is distributing revised editions of its booklets, "The Welding of Aluminum" and "The Riveting of Aluminum." These two booklets include much data not contained in the earlier editions.

ARC WELDING COPPER. A twelve-page booklet, No. 9–7, released by the Hobart Brothers Co., Troy, Ohio, discusses arc welding of copper to copper and copper to steel by means of the newly developed "Long Arc" method.

BEARINGS, BALL. A condensed catalog, No. 17, issued by The Fafnir Bearing Co., New Britain, Conn., combines all information on the industrial uses of its radial ball bearings as well as the power transmission line.

BEARINGS, ROLLER. A new and revised "Engineering Journal" is available from the Timken Roller Bearing Co., Canton, Ohio. The journal consists of 258 pages of engineering information that includes descriptions of the various types of bearings, data on ratings, load calculations, bearing selection and information pertinent to the mounting, use and maintenance of these bearings. A section is devoted to flanged bearings.

BRONZE CASTINGS. Standard bronzes, aluminum bronzes and super-tensile manganese bronzes, the typical uses of different grades and specifications are found in a booklet "Elesco Bronze Castings" published by The Superheater Co., Bronze Foundry Division, East Chicago, Ind.

BUSINESS INFORMATION. A publication "Guides to Business Facts and Figures," priced at $1.50, is available from The Special Libraries Association, 345 Hudson St., New York, N. Y. Librarians have analyzed 175 publications, grouped in eight sections, for the best sources of information on statistical information, financial information, income, wages and cost living, foreign commerce, transportation and communication, business management, and markets and marketing. Each publication is described and its publisher and price indicated. There is an exhaustive subject index.

CAPACITORS. Bulletin No. 710, "Ideal Capacitors for Power Factor Correction," available from The Ideal Electric & Manufacturing Co., Mansfield, Ohio, shows how the capacitor acts to correct low power factor and gives tables for determining the right size to use.

CHROMIUM TOXICITY. The Metropolitan Life Insurance Co., Policyholders Service Bureau, One Madison Ave., New York, N. Y., has prepared "Protection of Workers Exposed to Chromium and Its Compounds" which shows causes, effects and preventive measures. The booklet is of particular value because of the increasing number and diversity of uses of chromium and its compounds.

CORROSION-RESISTANT EQUIPMENT. The Haveg Corp., Newark, Del., has published a pamphlet on Haveg, a material used for building plating tanks and pickling tanks as well as other corrosion-resisting equipment in smooth jointless surfaces and in large sizes. The material is molded from a base material of acid-resisting asbestos and an acid-resisting phenol-formaldehyde resin.

HARD-FACING APPLICATIONS. The Haynes Stellite Co., Kokomo, Ind., has published a 96-page booklet entitled "Hard-Facing with Haynes Stellite Products," in which is given a detailed description of the various hard-facing materials and the correct procedure for

their application by both the oxy-acetylene and electric-arc processes. Sections of this booklet show jigs and fixtures for facilitating the operations.

REMOTE CONTROL EQUIPMENT. Bulletin No. 10-A, published by the Hart Manufacturing Co., Hartford, Conn., shows "Diamond H" remote control switches.

RUST PREVENTION. The Dearborn Chemical Co., Department H-1, 310 South Michigan Ave., Chicago, Ill., has available a booklet "Proof of Results with No-Ox-Id in the Railroad Field," showing savings made by the prevention of rust and corrosion.

POLISHING GRAIN. "The Technical Aspect of Polishing Grain" is the subject of the booklet "Research and Alundum Polishing Grain," published by Norton Co., Worcester, Mass.

WRENCHES AND TOOLS. Bonney Forge & Tool Works, Allentown, Pa., has issued catalog No. 34, describing and illustrating a line of wrenches, screw drivers, chisels, punches, hammers and similar tools.

• PATENTS •

NOVEMBER 28, 1933

Metal-Working Machinery

Hobbing Machine. Julian L. Perkins, West Springfield, and Hiram D. Croft, Springfield, Mass., assigned to Perkins Machine & Gear Co. Patent 1,936,730.

Machine Tool. Julian L. Perkins, West Springfield, Mass., assigned to Perkins Machine & Gear Co. Patent 1,936,731.

Hydraulic System and Mechanism Therefor. Ralph E. Flanders, Springfield, Vt., assigned to Jones & Lamson Machine Co. Patent 1,936,756.

Welding Apparatus. Gustav H. Koch, Salem, Ohio, assigned to Westinghouse Electric & Manufacturing Co. Patent 1,936,794.

Metal Working Press. Fredrich J. Rode, Chicago, Ill. Patent 1,936,880.

Hydraulic Press Control Mechanism. Ernst Brockel, Augsburg, Germany, assigned to Maschinenfabrik Augsburg-Nurnberg A. G., Augsburg, Germany. Patent 1,937,007.

Machine Tool. Clifford A. Bickel, Sidney, Ohio, assigned to The Monarch Machine Tool Co. Patent 1,937,400.

Machine Tool. John R. Johnson, Rockford, Ill., assigned to the Ingersoll Milling Machine Co. Patent 1,937,408.

Tools and Attachments

Means for Cutting External Screw Threads. Robert Thomson, Arlington, N. J., assigned to Dardelet Threadlock Corp. Patent 1,936,696.

Diehead. Levi G. Warren, West Haven, Conn., assigned to the Eastern Machine Screw Corp. Patent 1,937,418.

DECEMBER 5, 1933

Metal-Working Machinery

Method of and Machine for Producing Gears. Allan H. Candee and Leonard O. Carlsen, Rochester, N. Y., assigned to Gleason Works. Patent 1,937,628.

Grinding Machine. Amos P. Steiner, Waynesboro, Pa., assigned to Landis Tool Co. Patent 1,937,726.

Method of and Machine for Producing Gears. Arthur L. Stewart, Allan H. Candee, and Leonard O. Carlson, Rochester, N. Y., assigned to Gleason Works. Patent 1,937,727.

Equalizing Riveting Machine. Frank O'Brien, Flint, Mich., assigned to General Motors Corp. Patent 1,937,908.

Work-Rotating Structure for Machine Tools. Herbert L. Flather, Nashua, N. H.; Joseph H. Flather and Herbert H. Flather, administrators. Patent 1,937,948.

Means for Lubricating Tool-Holding Rests for Machine Tools. Herbert L. Flather and Joseph H. Flather, Nashua, N. H.; Joseph H. Flather and Herbert H. Flather, administrators of said Herbert L. Flather, deceased. Patent 1,937,949.

Roll Grinding or Similar Machine. Carl F. Schnuck, New Haven, Conn., assigned to Farrel-Birmingham, Co., Inc. Patent 1,937,985.

Camshaft Grinding Machine. Thomas C. Van Degrift and William H. McCoy, Detroit, Michigan. Patent 1,937,999.

Tool Slide Actuating Mechanism. Edwin R. Smith and Juel L. Peterson, Seneca Falls, N. Y., assigned to Seneca Falls Machine Co. Patent 1,938,050.

Drilling Machine and the Like. Ralph M. Lovejoy, Boston, Mass. Patent 1,938,107.

Broaching Machine. Charles Vallone and John H. Illig, Buffalo, N. Y., assigned to Barcalo Manufacturing Co. Patent 1,938,233.

Spindle Drive for Machine Tools. Gustaf Robert Appelberg, Bridgeport, and Dudley B. Bullard, Southport, Conn., assigned to the Bullard Co. Patent 1,938,310.

Means for Controlling Gear Shifting Mechanism. Kurt H. Conley, Bridgeport, Conn., assigned to the Bullard Co. Patent 1,938,319.

Machine for Circular Grinding. Alfred M. Remington, Fitchburg, Mass., assigned to Simonds Saw & Steel Co. Patent 1,938,439.

Die Forming Apparatus for Large Sheets of Material. Edgar Watson, Towson, Md., assigned to the Lafayette Co. Patent 1,938,473.

Tools and Attachments

Wheel Truing Device. Roland V. Hutchinson, Lansing, Mich., assigned to General Motors Corp. Patent 1,937,961.

Chuck. Raymond R. Serles, New Britain, Conn., assigned to the Fafnir Bearing Co. Patent 1,938,356.

Chuck. Harold A. Tomkins, Jackson, Mich. Patent 1,938,409.

Broaching Tool. William H. Hart, Detroit, Mich., assigned to Colonial Broach Co. Patent 1,938,424.

Processes

Induction Electric Pipe Welding. Landorff M. Correll, Youngstown, Ohio. Patent 1,937,945.

DECEMBER 12, 1933

Metal-Working Machinery

Knee Type Milling Machine. Edward J. Kearney, Wauwatosa, Wis., assigned to Kearney & Trecker Corp. Patent 1,938,661.

Machine Tool. William F. Groene, Cincinnati, Ohio, assigned to the R. K. LeBlond Machine Tool Co. Patent 1,938,696.

Grinding Machine. Emil Ritz, Jr., Mount Healthy, Ohio, assigned to the Hisey-Wolf Machine Co. Patent 1,938,723.

Grinding Machine. Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,756.

Grinding Machine. Sol Einstein and Frederick S. Haas, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,757.

Spindle Oscillator. Hans Ernst, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,758.

Grinding Machine. Hans Ernst, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,759.

Grinding Machine. Hans Fritschi, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,760.

Machine Tool. Hans Fritschi, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,761.

Grinding Machine. Frederick S. Haas, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,762—1,938,763.

Grinding Machine. Frederick S. Haas

and Hans Fritschi, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,764—1,938,765.

Grinding Machine. Cecil W. Hopkins, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,766.

Grinding Machine. Bernard A. Kearns, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,767.

Machine Tool. Clifford L. Schulte, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,768.

Grinding Machine. Andrew Strom, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,938,769.

Milling Machine. Walter D. Archea, Norwood, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,770—1,938,771.

Hydraulic Drive for Milling Machines. Hans Ernst, Cincinnati, and Herman R. Isler, Norwood, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,772.

Rotary Cutter. Hans Ernst and Lester F. Nenninger, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,773.

Milling Machine. Hans Ernst and Mario E. Martelotti, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,774.

Milling Machine. Lester F. Nenninger, Cincinnati, and Walter D. Archea, Norwood, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,775.

Milling Machine. Lester F. Nenninger and Fred A. Hassman, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,776.

Milling Machine. Lester F. Nenninger, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,777.

Cutter Guard. Lester F. Nenninger, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,778.

Transmission and Control Mechanism for a Milling Machine. Lester F. Nenninger, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,779.

Power Operated Clutch for Machine Tools. Lester F. Nenninger and Bernard Sassen, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,780.

Milling Machine. Lester F. Nenninger and Bernard Sassen, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,781.

Milling Machine Spindle Carrier. Robert W. Ott, Cincinnati, Ohio. Patent 1,938,782.

Milling Machinery. Millard Romaine and Walter D. Archea, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,783.

Machine Tool. Millard Romaine, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,784.

Transmission Mechanism. Bernard Sassen, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,785.

Spring Operated Wiper. Edgar Donald Vancil, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,938,786.

Coolant Supply for Machine Tools. Frank E. Stratton, Edgewood, R. I., assigned to Diamond Machine Co. Patent 1,938,875.

Lathe Headstock. William G. Hoelscher, Norwood, Ohio, assigned to the American Tool Works Co. Patent 1,938,906.

Grinding Machine. Joseph Dyson Scaife, Leamington Spa, England, assigned to the Heald Machine Co. Patent 1,938,933.

Metal Working Apparatus. Byron F. Bower, Western Springs, and Harold P. Mooy, Chicago, Ill., assigned to Western Electric Co., Inc. Patent 1,939,038.

Hydraulic Operating System for Machine Tools. Edward P. Burrell, Shaker Heights, Ohio, assigned to the Warner & Swasey Co. Patent 1,939,102.

Stock Feeding Mechanism. Harry W. Rupple, Shaker Heights, Ohio, assigned to the Cleveland Automatic Machine Co. Patent 1,939,320.

Tools and Attachments

Safety Device for Punch Presses. Bert H. Hawkins, Royal Oak, Mich., assigned to McCord Radiator & Manufacturing Co. Patent 1,939,006.

Chuck. Walter M. Snyder, Detroit, Mich., assigned to Sundstrand Machine Tool Co., Patent 1,939,147.

Honing Tool and Fixture. Kirke W. Connor, Detroit, Mich., assigned to Micromatic Hone Corp. Patent 1,939,205.

Indexing Mechanism. Edward J. Kearney, Wauwatosa, Wis., assigned to Kearney & Trecker Corp. Patent 1,939,266.

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Metal-Working Machinery

Die Casting Machine. Martin Scheible, Detroit, Mich. Patent 1,939,831.

Hydraulic Press. Walter Ferris, Milwaukee, Wis., assigned to the Oilgear Co. Patent 1,939,886.

Die-Casting Machine. William J. During, Syracuse, N. Y., assigned to Precision Castings Co., Inc. Patent 1,939,960.

Milling Machine. William D. Averill, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,940,112.

Milling Machine. Fred A. Hassman, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,940,126.

Milling Machine. Lincoln E. Mehlhope, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,940,139.

Milling Machine. Robert W. Ott, Cincinnati, Ohio. Patent 1,940,142.

Motor Mount for Milling Machines. Edgar D. Vancil, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,940,158.

Power Press. Rudolph Furrer, Wauwatosa, Wis., assigned to A. O. Smith Corp. Patent 1,940,250.

Machine for Riveting, Punching, Pressing, Stamping, and Like Operations. Arthur Newton Jackson, Manchester, England, assigned to De Bergue's Patents Ltd., Manchester, England. Patent 1,940,304.

Automatic Arc Welding Device. William E. Smith, Detroit, Mich., assigned to the Murray Corp. of America. Patent 1,940,331.

Lathe. Leo A. Dumser and Clement J. Schroeder, Rockford, Ill., assigned to Sundstrand Machine Tool Co. Patent 1,940,403.

Feeding Mechanism for Machine Tools. Leo A. Dumser, Rockford, Ill., assigned to Sundstrand Machine Tool Co. Patent 1,940,404.

Milling Machine. Louis H. Blood, Cincinnati, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 1,940,443.

Shear. John Jensen, Rockford, Ill., assigned to Whitney Metal Tool Co. Patent 1,940,497.

Tools and Attachments

Screw Thread Gauge. Robert O. Beardsley, Springfield, Vt., assigned to Jones & Lamson Machine Co. Patent 1,939,643.

Chuck. Fred J. Bechert, Stamford, Conn., assigned to The Fafnir Bearing Co. Patent 1,939,644.

Broach. Francis J. Lapointe, Ann Arbor, Mich. Patent 1,939,820.

Diamond Cutting Tool or the Like and Method of Making the Same. Carl A. Krussell, Belmont, Mass., assigned to Hard Metal Alloys, Inc. Patent 1,939,991.

Processes

Method for the Promotion of Threads in Screw-Thread Rolling Cheeks. Konrad Nagel, Nuremberg, Germany, assigned to Heinrich Fuld and Ernst Hessdorfer, both of Nuremberg, Germany. Patent 1,940,367.